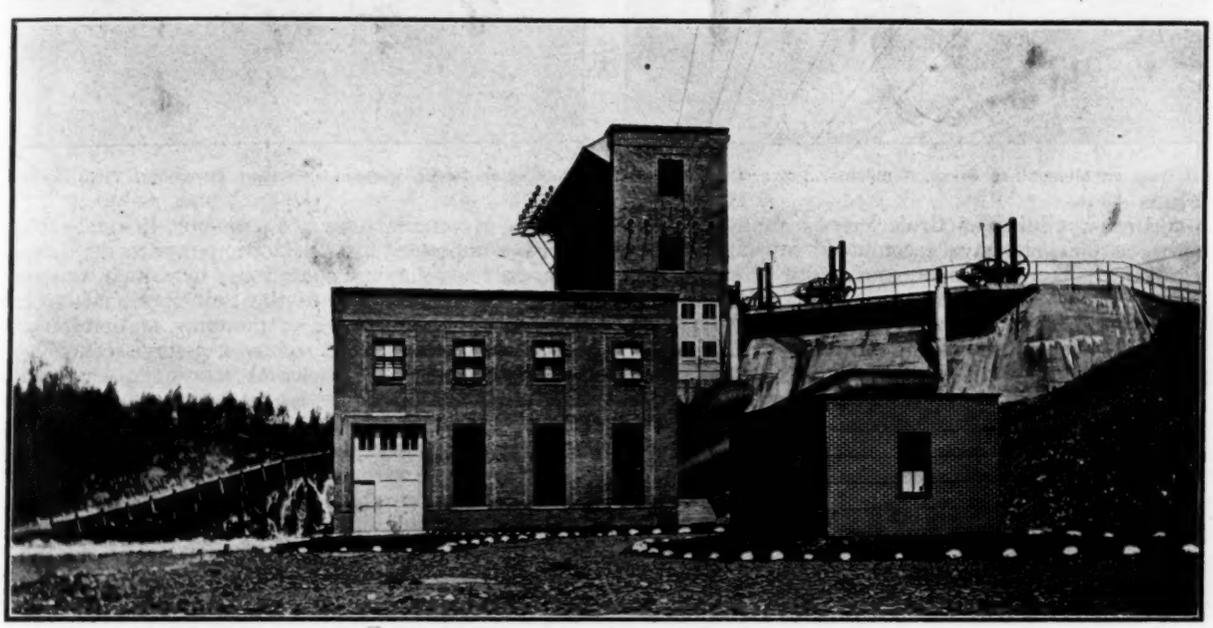
# Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT.

Vol. 72.—No. 25. CHICAGO, SATURDAY, JUNE 22, 1918. Page 1027.

Hydroelectric Station of Peninsular Power Company at Twin Falls, Near Iron Mountain, Mich.

# Hydroelectric Development in Iron Mountain Region

## *Peninsular Power Company Meeting Excessive Demands in Mining Districts—New Station Under Construction on Brule River*

THE activity of mining operations in Iron River, Florence and Alpha districts, of Wisconsin and Michigan, have created great demands for electric power within the last six years. The region referred to embraces a small part of the two states drained by the Menominee and Brule Rivers. This mining industry supports the cities of Iron Mountain, Iron River and Florence, which consume a considerable amount of energy for lighting, street railways and industrial power.

The pincipal demand for electric power is due to the operations of the 21 mines in the districts referred to, where all mine pumps, hoists, ore crushers, blowers, haulage equipment and shop tools are motor operated.

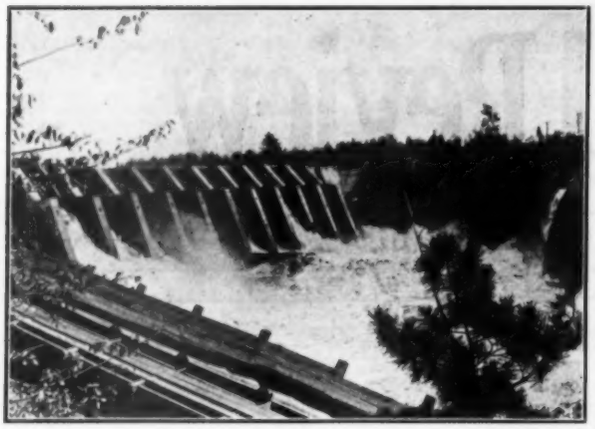
### Central Station Service.

The principal part of the energy consumed for mining operations and municipal and other service is supplied by the Peninsular Power Company. This concern has had in operation a hydroelectric power plant on the Menominee River, at Twin Falls, since 1912, and has under construction another hydroelectric plant on Brule River, in the vicinity of Florence, Wis. The Twin Falls plant, situated four miles north of Iron Mountain, Mich., is equipped with five Westinghouse generators of a combined generating capacity of 5800 kilowatts, each driven by a Leffel water turbine. Three Lombard and two Woodward governors are provided for the five turbine units. The switchboard equipment is the Westinghouse make. The concrete dam, which is shown in the illustration, rests upon solid rock and gives a 44-foot head at the turbines.

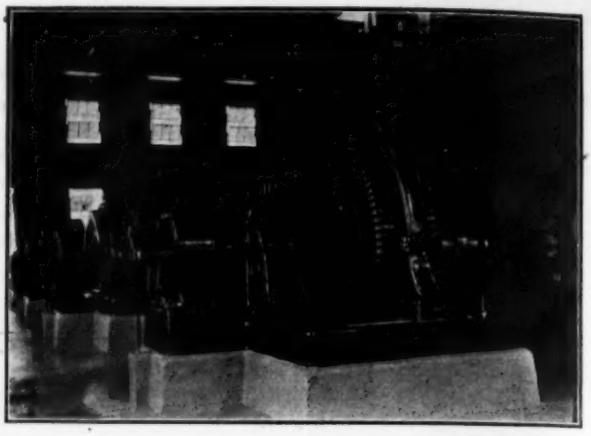
### Transmission to Mining Centers.

The company has 40 miles of high-tension lines whereby energy at 66,000 volts is transmitted to the several towns and the three mining districts. The system, which delivered 25,000 kilowatt-hours in 1912, has increased the load to 1,600,000 kilowatt-hours for this year. The service of this plant is supplemented by an auxiliary power station, at Iron River, equipped with steam turbines and generators of 4000 horsepower capacity.

The new hydroelectric power station which this



Dam on Menominee River, Peninsular Power Company.



Generator Room, Peninsular Power Company, Twin Falls.

company is building on Brule River is being equipped with two units, to have a combined capacity of 3300 kilowatts. The equipment consists of Westinghouse vertical generators, direct-connected to Leffel water wheels. When this plant is completed and transmission lines are built to tie in this service with that of the Twin Falls lines, the company will have a system from which about 9000 kilowatts can be delivered, exclusive of what may be produced at its steam-electric plant.

### High-Tension Lines and Substations.

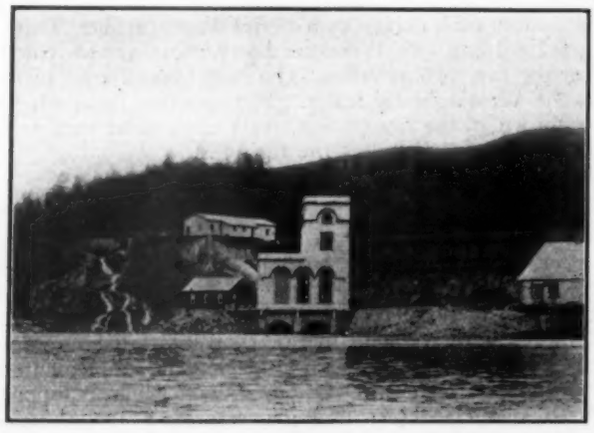
The high-tension lines are carried on steel towers, the bases of which are set in concrete. The power is metered to consumers from substations of three transformers each, by which the high voltage of 66,000 is stepped down to 2200 volts. In most cases of underground operating, especially for pumping, the motors are operated at 2200 volts. The conductors for mine work consist of 3-wire, varnished-cambric, or rubber-insulated, lead-covered, jute-wrapped, steel-armored cable, practically eliminating all danger from contact. The special ground-resistance rheostat is used to prevent line switch from automatically opening when a ground occurs on the line.

### A Mine Service Power Plant.

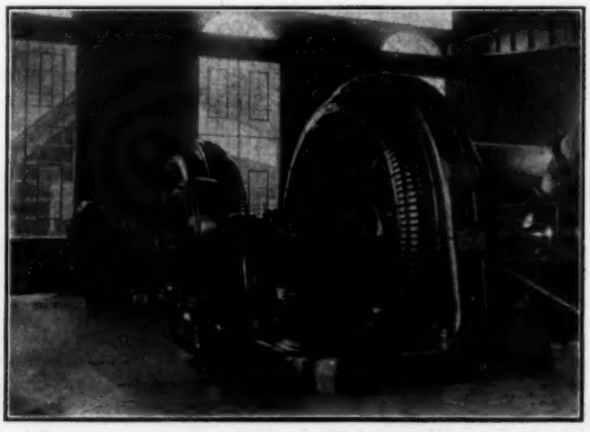
The Oliver Iron Mining Company operates its own hydroelectric plant of the capacity of 5000 horsepower. This was built at Quinnesec Falls, Mich., in 1914. A steam-electric unit is also provided for use in case of an emergency. This power is transmitted a distance of four miles to the company's Chapin mine at Iron Mountain, over a 13,200-volt line. Perhaps the most important use of electric power at the Chapin mine is for pumping operations, by which water is raised from the bottom of the 1360-foot shaft to the surface by two lifts. The pumping station on the 1360-foot level consists of two 3-stage centrifugal pumps, each of the capacity of 3000 gallons per minute; and each pump is driven by a 450-horsepower motor. These pumps deliver the water 392 feet to a relay station at the twelfth level, 965 feet from the surface. There are two 6-stage centrifugal pumps at the relay station, each driven by a 1050-horsepower motor and capable of raising 3000 gallons per minute to the surface against the head of 965 feet. A view of the plant is shown herewith.

### Electric Power Adapted to Mining.

The adaptability of electric power to the metal-mining operations has been thoroughly demonstrated in all the mining regions of the country where it is applied to practically all kinds of machines except the high-power mine drill, for which compressed air still remains the motive power; but in most cases the compressors, from which those drills are supplied with compressed air, are motor-driven. The features of electric power which commend it to mine operators are readiness of service, economy of operating and adaptability, and most of all, under existing conditions, is the conservation of fuel effected by use of electric energy. The provisions for steam auxiliaries to hydroelectric plants are merely precautionary measures to provide for emergencies due to accidents or the possible destruction of the operating units.



Hydroelectric Plant of Oliver Iron Mining Company.



Generator Floor, Oliver Iron Mining Company's Plant.

# The Central Station and the Industrial Electric Heating Load

## *Second Installment of Article Dealing With the Vast Opportunities of Industrial Electric Heating as Source of Income—Some Interesting Examples of Installations*

By ARTHUR F. ALLSOP

*Industrial Heating Engineer, Commonwealth Edison Company.*

OWING to the numerous and extremely varied applications of industrial heat together with the different conditions encountered, it is impossible to give figures which could be used as a standard method of estimating the possible income to be derived from a proposed installation. The following table may, however, serve to give an idea of what might be expected.

While most of the installations mentioned in the above table are on the lines of the same central station it will be noticed that the charge per kilowatt-hour varies considerably. This can be explained by the fact that some of the apparatus is used by customers who are large users of electrical energy and others are small users, the central station's rate schedule being such that the greater the number of kilowatt-hours used per month plus the number of hours use per month the lower the average rate per kilowatt-hour.

### Industrial Heating Load-Factor.

A large number of industrial heating devices and applications can be credited with a load-factor of 100 per cent. The envelope gum dryer for example, already mentioned, is in continuous operation twenty-four hours per day and brings the central station a yearly income of $87.00. Another example of 100 per cent load-factor is the photographic print, film and plate drier. This device has a connected load of 12 kilowatts and brings an income of approximately $1500.00 per year.

### Variation of Load.

As would be expected, the load of an industrial heating installation varies according to the supply and demand for the goods for which that particular application is applied, and if this should be a seasonable one some period of the year will be the peak point and the consumption increasing to and from this period. If, however, the installation is used in conjunction with a non-seasonable product the load is governed entirely by the amount of business the manufacturer is able to secure. The accompanying table gives an idea of what can be expected from an installation of devices used by a concern whose goods are seasonable.

| Month. | Kilowatt-hours per month. | Monthly bill. | Average rate per kilowatt-hour. |
|---|---|---|---|
| July | 93 | $ 9.30 | 10.0c |
| August | 141 | 11.55 | 7.0c |
| September | 247 | 17.35 | 6.7c |
| October | 319 | 21.45 | 6.4c |
| November | 368 | 23.80 | 5.6c |
| December | 413 | 23.52 | 5.7c |
| January | 518 | 29.82 | 5.4c |
| February | 682 | 37.08 | 6.4c |
| March | 391 | 21.87 | 6.4c |
| April | 254 | 16.62 | 6.6c |
| May | 154 | 12.10 | 7.9c |
| June | 233 | 15.54 | 6.6c |
| | 3,739 | $240.00 | 6.4c |

Average monthly kilowatt-hours used, 312.
Average monthly bill, $20.00.
Average rate per kilowatt-hour, 6.4c.

With this installation the peak period occurs during January and February.

Generally it has been found by central stations having industrial heating loads, that these peak periods do not show as peaks on the station load-curve but tend to give a fairly well defined line, one industrial installation peak offsetting another.

Fig. 1 shows graphically the industrial heating load secured by the Commonwealth Edison Company, year by year from 1913 to 1917. It is a composite curve showing the load secured by use of industrial devices (arc furnaces excluded) sold by the central station itself and those promoted by the central station

| Device. | No. of devices. | Used in— | Kilowatts Consumed. | Kw-h. per month. | Average energy rate. | Average monthly income. |
|---|---|---|---|---|---|---|
| Linotype pot | 1 | Small newspaper office | 1.650 | 197 | 5.1 | 10.23 |
| Irons (commercial) | 11 | Shirt waist factory | 7.000 | 312 | 6.4 | 20.00 |
| Glue pots | 45 | Box factories | 3.150 | 728 | 4.6 | 33.48 |
| Soldering irons | 14 | Phonograph factory | 2.800 | 585 | 5.5 | 32.17 |
| Tailor irons | 13 | Men tailors | 11.100 | 670 | 5. | 33.50 |
| Branding irons | 3 | Bottling works | 1.050 | 98 | 7.1 | 6.95 |
| Drying oven (small) | 1 | Watch dial factory | 1.760 | 375 | 6.4 | 24.00 |
| Sealing wax pots | 2 | Wholesale jeweler | .400 | 52 | 8.8 | 4.57 |
| Envelope gum dryers | 6 | Envelope factory | 6.600 | .... | 2.7 | .... |
| Roofing joiners | 3 | Roofing manufacturings | 19.600 | .... | .. | .... |
| Enameling oven | 1 | Auto factory | 260. | 125,000 | .. | .... |
| Photo print dryers | 1 | Large newspaper office | 12. | 8,640 | .. | .... |
| Japan heating | 1 | Novelty works | 1.650 | 208 | 6.2 | 12.89 |
| Photo, developing, bath heaters | 1 | Photographic work | 1.200 | 156 | 7.5 | 11.70 |
| Oil heating | 1 | Brass foundry | 3.000 | 416 | 5.5 | 22.88 |
| Temper drawing ovens | 2 | Tool works | 10.000 | 4,000 | 2.2 | 88.00 |
| Core baking ovens | 2 | Foundry | 50.000 | 12,500 | 1. | 125.00 |
| Putty warmer | 1 | Sash and door factory | 1.650 | 368 | 5.5 | 20.24 |
| Embossing press | 1 | Binding | 1.200 | 156 | 5.1 | 7.95 |
| Vulcanizers | 5 | Tire factory | 3.000 | 780 | .. | .... |

but sold by others, such as manufacturers of heating devices, jobbers, etc. The load connected by the devices sold by the central station alone is shown dotted, Fig. 1. This central station has an estimated connected industrial heating load of 43,030 kilowatts. A table showing what devices and the number of each which go to make up this load appeared on page 803 May 11, issue of ELECTRICAL REVIEW.

While unusual business conditions are partly responsible for the marked increase of the years 1916 and 1917 over previous years, the fact that industrial electric heating is steadily gaining favor year by year must not be lost sight of.

### WHO SHOULD SELL THE APPARATUS.

Strictly speaking the central station should not care whether the central-station company, the manufacturer or some other concern actually makes the sale to the customer so long as the customer gets the right article for the right purpose. The main point in view is the income to be derived. Time and effort should not be wasted arguing who is entitled to make the sale of the merchandise, but the central-station representatives should be made responsible for all the heating apparatus on the company's lines and endeavor to keep them in first-class shape thereby giving the best possible satisfaction. They should also be relied upon to protect the customer, seeing that he gets the right article for the right purpose, and at the same time protect the central-station company.

### OBTAINING THE LOAD.

No matter how small the central-station system, owing to the character of industrial heating it is advisable that some one person specialize on this class of business. If the size of a company does not warrant the entire time of one man to care for this class of business it should be assigned to some one person, preferably a power salesman, who can devote enough time to it to do the subject justice. Experience has shown that the former method is by far the best system, however. Another method is to have all the salesmen boosting industrial electric heating and the calling in of the manufacturers of heating apparatus and relying upon them to close the deal with the assistance of a central-station man familiar with the rates. The disadvantage of this method is unavoidable in that there are numerous cases where a number of manufacturers of industrial heating apparatus, as might be expected, all claim they supply the best appliance for any purpose, but which is far from correct. Experience has shown, for instance, that while one manufacturer may have a glue pot that is far superior to any other on the market its immersion heater applied to liquid heating problems may be the poorest, or possibly they do not have one at all and not caring to see any business fall into their competitors they would probably convince the prospect that the application can be accomplished by means of their flat unit which can be attached beneath the liquid container instead of immersed in the liquid, resulting in lower efficiency and more trouble in installing and probably much more costly. It is this knowledge of the superiority of one device over another on the part of the central-station representative that protects both the customer by seeing that he gets the right device for the right purpose and protects the central station by assuring a satisfied customer.

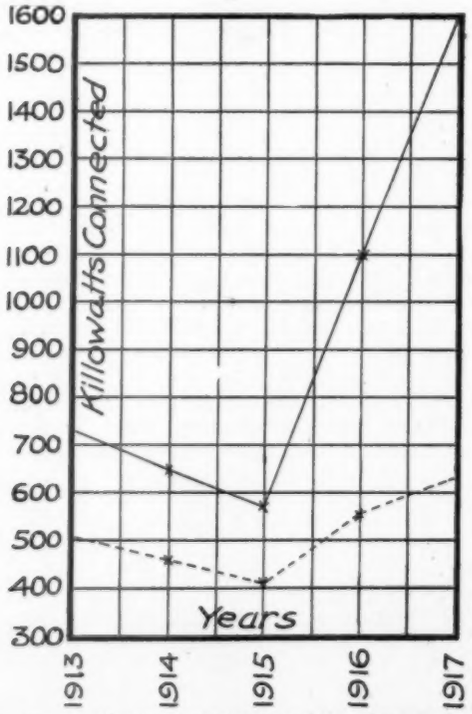



Fig. 1.—Curves Showing Industrial Heating Load Procured by Commonwealth Edison Company Year by Year From 1913 to 1917.

The closing of a contract for industrial electric heating or the selling of the apparatus does not end the central station's part in this business. After the installation is completed the central-station representative should co-operate to the utmost possible extent with the customer in order to obtain the greatest efficiency with the apparatus, which can be obtained by imparting to the foreman or operators any knowledge that would be of assistance in increasing production, improving the products, or keeping the kilowatt-hour consumption at a minimum.

### THE MAN TO HIRE.

Like any other project, this class of business must be financed; for this reason central stations must invest some capital—money and brains as well. If the field covered by the central station is large enough to warrant it a man should be hired and trained specially. The manufacturing industry being so extensive, a broad-gauge man is essential, and while it is impossible to obtain a man with a complete knowledge of every branch and phase of every industry the next best thing should be done.

A knowledge of any or, better still, all of the following subjects will be found a great asset:

Chemistry: Very often the heating of materials, etc., performs chemical changes in the product and a conception of what is happening chemically is essential. Metallurgy: This is necessary when seeking steel or other furnace and heat treating of metal propositions. Machine design: necessary if the industrial heating specialist is to undertake the design of electric heating apparatus which is to form part of a machine. Drafting: If the industrial heating specialist instead of taking the responsibility of the design of special heating apparatus wishes to transfer information to the heating device manufacturers, who might be many hundreds of miles away, the ability to make up a drawing of the machine or part of a machine to which heating units are to be applied drafting is almost essential, the better the drawing the more time will be saved in the long run, as a manufacturer will not attempt to manufacture or suggest a

special appliance or unit unless in possession of the most possible data. In the above case a photograph is a great help.

### Things an Industrial Heating Salesman Should Know.

Although it is possible in many cases to close an industrial heating proposition without figuring fuel cost the industrial heating engineer should be thoroughly familiar with the market price of various fuels together with their heating value and efficiency to which they can be applied. This will enable him to determine for himself the ratio between electric heating and other heating media instead of taking the customer's idea which he has probably guessed or has had given to him by a salesman selling a competition device. It has been the writer's experience that when selling electric heating in competition with gas that the gas men knowing fully the superiority of electric heat and realizing the only leg they have to stand on was that of cheaper fuel costs, have intentionally underestimated their fuel cost.

The industrial heating salesman should next acquaint himself with the various standard industrial appliances on the market and determine by means of tests either laboratory or practical their characteristics. In the latter case by placing out the different makes of devices with various customers and deciding which is the best device and then recommending that until he is thoroughly convinced that some other make is superior. It does not do to let the flowery talk of some manufacturer's agent convince you, prove it to yourself, for there is too much at stake to jeopardize the customers' faith in the central station. The above practical method of testing, of course, can only be done with the standard every-day devices, such as glue pots, soldering irons, units for liquid, water heating, etc. With the larger installations the opinion of some other central station having had experience with that particular type of installation should be obtained if possible. This is not a very hard thing to do and is, in fact, being done quite extensively. A guarantee should also be obtained from the manufacturer.

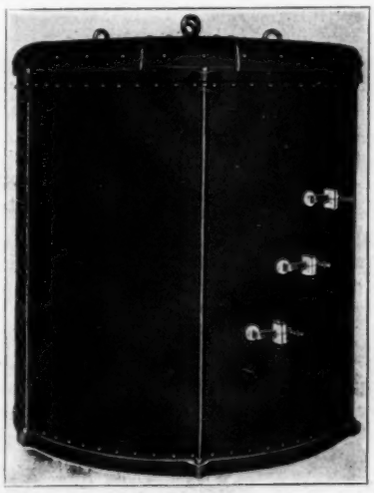


Fig. 2.—Side View of One Section of Gun Heater.

The specialist should next familiarize himself with as many standard types of heating units as possible which were designed originally for use on the smaller domestic class of heating appliances, such as flat irons, percolators, grills, air heater units, etc. It is surprising how many of these units can be efficiently and successfully applied to some special installation or process. For instance, percolator units have been successfully used for heating molding machines, and toaster units have been used for the same purpose; grill units have been used for ink-drying presses and ink heating, also for drying gum on envelope-making machines; air-heater units for heating sprinkler valves; soldering-iron units for heating celluloid embossing presses and wax heating on shoe machinery; flat-iron units (leaf type) for heating rubber vulcanizers and corn popping machines. Then again many standard devices can be used for other purposes than those for which they were designed, for example, glue pots, as well as being used for water, wax, compound and heating other liquids have, after removing the glue contained been used for heating sand and used by violin makers, by fitting a special spout shaped cover they can be used for steaming cloth, upholstery, wood, etc. Soldering irons have been used for cauterizing and by replacing the soldering tips with special tips used for branding, can-capping and wax melting. Disc stoves of the solid or non-luminous type by using a device with a 220-volt unit on 110-volt service have been used for celluloid heating. Standard plate and food warmers make ideal ovens for very low-temperature work, such as incubators, material heating, etc. Water heaters of the circulation type can be successfully applied to the heating of special glue pots such as are sometimes used on cardboard box making machines. The above is by far from a complete list, the limit depending upon the ingenuity of the specialist, but emphasizes the wide field and feasibility of electric heat.

Fig. 3.—End View of One Section of Gun Heater.

### Data Collection.

The industrial heating specialist to start right from the very first should collect all possible data pertaining to industrial heating not only electric, but gas, oil, coal, etc., and file in a tangible way. There are times when this is invaluable for reference work. It is well to keep in mind the fact that it is not the amount of actual data that a sales engineer can keep in his head, but the knowledge of where to get data pertaining to a particular problem that counts.

It has been the experience of the author that in a large number of cases before an industrial heating proposition is closed the prospective customer expects an unlimited amount of data relative to costs, etc., to be submitted and insists upon installing a meter to check up current consumption, etc., making it perfectly plain to you that he intends to keep an exact account of all phases of the installation. If the sales engineer

has confidence in his figures and data submitted this of course does not worry him; in fact, it rather pleases him as he expects to get from the customer some very useful and up-to-the-minute data. But unfortunately, when the end of the month or whatever the duration of the observation period expires, he is informed that the equipment is entirely satisfactory, that the customer neglected to keep the before-mentioned records and does not wish to be bothered now by doing it and requests that the check meter be removed. Of course you have the number of kilowatt-hours used but this is of little value if the amount of product handled is not available.

### Large and Small Installations.

Often industrial heating manufacturers tend to discourage the industrial heating salesman in going after the small device and appliance business suggesting that larger installations are more profitable (maybe they are to them) but the writer is of the opinion that while the larger installations, say of 100 kilowatts and above, take considerably longer to secure, quite often an equal number of kilowatts can be connected in the same length of time, with the advantage that a 100-kilowatt installation sold to a single customer who is probably already a large user of energy and obtains a rate of let us say 2 cents per kilowatt hour, while a 100-kilowatt load consisting of anywhere from 25 to 200 devices in as many different smaller factories earning a rate of 4 cents per kilowatt-hour thereby shows an increase of 100 per cent as an income producer over the single installation of the same connected load. More likely than not the smaller devices will be used by customers earning a much higher rate of, say, 8 or 9 cents per kilowatt-hour. However, the logical solution to the above problem is undoubtedly to secure both.

### Small Effort Sometimes Necessary.

That only a small amount of effort is necessary to obtain a heating load and how anxious some customers are to obtain successful installations of industrial heating is shown by the two following actual examples. About two years ago the writer received a visit from the superintendent of a large novelty manufacturing concern specializing in celluloid novelties, such as small mirrors and lapel buttons. His experience had been as follows: A number of months previous he had conceived the idea that electricity was the ideal method of heating the dies of his forming presses, his deductions being made from the success of the domestic flat iron and his sorrowful experience with gas-heated dies, which in some instances it was impossible for him to use. He proceeded to get in touch with a small manufacturer of heating devices whose limit of experience ended with the electric curling iron, heating pad and the like. They built several units for him which were impractical and impossible. Not to be discouraged, however, he hit upon the idea of making his own units and being familiar with neither the principles of electricity nor electric heating he decided to attend a night course in electricity at a local technical school with the idea in mind of obtaining enough knowledge to enable him to make his own heating units.

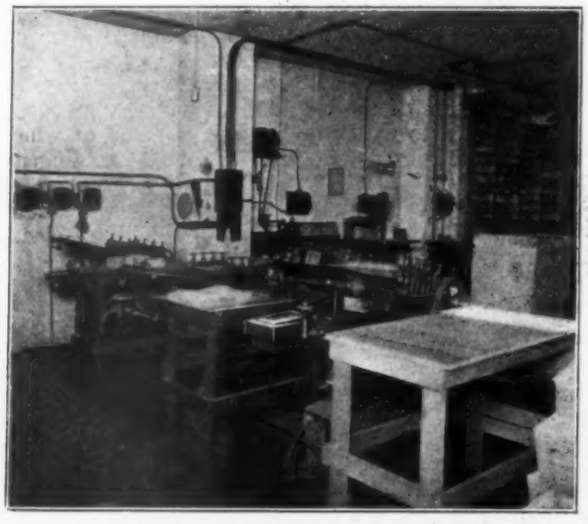


Fig. 4.—Installation of Carton-Making Machines.

His company had by this time secured a very large order for celluloid novelties which only the use of electrically heated dies could make. After attending the technical class for two months, a piece of advertising matter sent out by the local central-station company describing electricity for industrial heating arrived at his office. Being impressed with the central station's offer to solve heating problems he immediately proceeded to the company's office and approached the writer with the advertisement in one hand and a couple of his dies in the other. To shorten the story, the next day eight heating units were delivered to him. After 10 minutes' machine work on each of them they were applied so that any unit was interchangeable with any die and could be attached in less than 5 seconds. A few days later an order was received for 17 more units completing the installation. These have now been in use for about two years giving entire satisfaction. The units used were of standard type and make. This, the author believes, emphasizes the fact that the success of the industrial heating specialist is largely due to his knowledge of the many hundred of heating units on the market and of their practicability and reliability.

About a year later a very similar case came to the writer's attention. This time the customer had a corset ironing machine which he was desirous of heating electrically. He had been endeavoring to make a unit by taking the windings from small domestic type toasters and remaking them to meet his requirements. After burning out a large number of elements and about to give up the idea he called upon a friend of his one evening to pay a visit. During the course of the conversation he told his troubles to his friend. His friend happened to be the superintendent of the novelty company whose case was just previously mentioned. Result, the next morning the writer received a 'phone call to see the party in question, and in less time than it takes to tell obtained an order for three special heating units, one of which was delivered to the customer that same day, the other two the following day, much to the satisfaction of the customer. Just a little work was involved in this case as it was necessary to use the heating element from a high-temperature air heater and rewind it on a special frame which was placed inside of the corset iron. If this problem had been submitted to the manufacturer to solve and supply, experience shows that several months would have elapsed before the customer's needs were taken care of.

### Industrial Heating and War Work.

Factories engaged in war work offer a fertile field for industrial heating devices and applications. Efficiency, speed and safety are essential in this work and very little trouble should be experienced in securing

this class of business. A great deal of this business has been secured, a lot of which was obtained before the entry of the United States in the war, when factories were engaged on war work for foreign nations. In many cases the Government specified certain operations to be performed with electrically heated apparatus.

A glance at the following table will give some idea of what certain devices can be used for.

INDUSTRIAL HEATING DEVICES AND APPLICATIONS WHICH ARE BEING USED ON WAR WORK.

Name of Device and Application.

Glue pots—Aeroplane parts (wings, fusilage, spars), auto bodies and trucks (wheel works), rocket and flare cases, powder and explosive containers.

Tailor irons—Uniforms, etc.

Core drying ovens—Foundries.

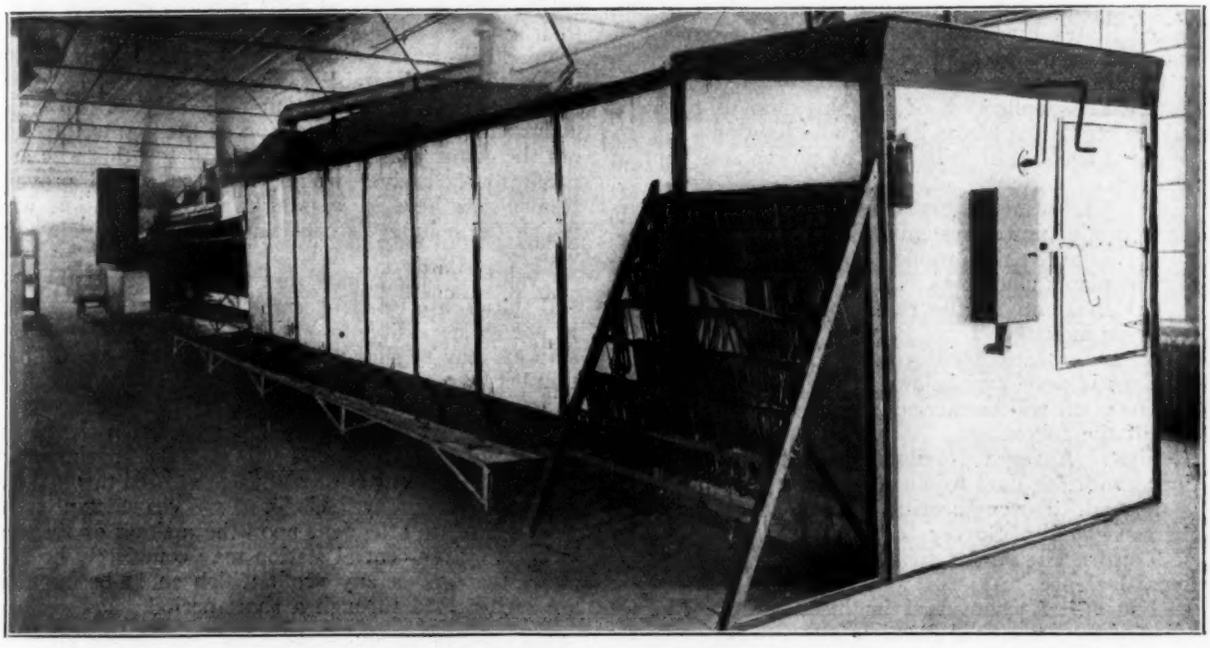


Fig. 5.—Japanning Oven, Connected Load of 260 Kilowatts.

Ironing machines—Fabric drying.

Branding Irons—Branding tool handles, instrument cases, etc.

Tempering ovens—Tools, dies and gauges.

Heat treating furnaces—Shell treating, tool dies, gauges, etc.

Rivet heaters—Shipbuilding and armor plates, etc.

Mould heating—Gas masks, gas and chemical containers.

Radiators—Heating shell filling rooms, heating magazines, heating dry rooms for aeroplanes wings, thawing explosives.

Oil preheaters for oil furnace—Foundries.

Drying ovens—Shell baking, explosive containers, drying instrument dials.

Disc stoves—Aeroplane wing-dope heating.

Gun furnaces—Shrinking gun jackets, tubes, rings, etc.

Sherardizing machines—Aeroplane parts, auto parts, etc.

Can cappers—Sealing aeroplane-dope cans, etc.

Soldering irons—Aeroplane parts, ignition system, and fuse parts, etc.

Metal melting pots—Hand grenade parts.

Tinning pots—Fuse parts.

Furnaces (muffle)—Optical goods.

Arc furnaces—Castings, etc.

Annealing furnaces—Shell, cartridge, brass and copper, etc.

Electrolytic furnaces—Hand grenade strikers.

Varnish heaters—Shell and auto body spraying.

In many cases electric heat is indispensable. Take for instance the gun treating furnace shown in Figs. 2 and 3. It is used for shrinking gun jacket, etc., in place These furnaces are usually of vertical type, cylindrical in shape and vary from fifteen to 75 feet in length, with internal diameters of from 3 to 7 feet. The temperature used ranges from 700 to 1000 degrees Fahrenheit, and while it is no easy matter to apply the heat of combustion to a furnace of these dimensions it is a very simple matter when electricity is used. The larger the gun the more important the use of electricity becomes since the heat is uniformly distributed and easily controlled.

The furnace is built in sections approximately 6 feet high, with a means of controlling the heat in each section individually. The sections are placed one on top of another and the gun is entirely surrounded. Figure No. 3 is a view looking down a section inside of the furnaces and Figure No. 2 is an exterior view of the same.

Under the heading of industrial heating and war work the following list of applications, each of which has been used by some government or another might be added, although this class of work is handled almost entirely by the manufacturer direct with the government and but rarely comes to the attention of central stations.

Cooking ranges (hotel type) for battleships.
Cooking ranges (hotel type) for cantonments.
Cooking ranges (special type) for submarines.
Automobile kitchens for use by troops on the march, etc.
Bake ovens for battleships and cantonments.
Radiators (special type) for submarine heating.
Electrically heated aviators' suits, gloves, socks and caps.
Electrically heated pads and blankets (hospital use).
Heating aviators' meals on aeroplane.
Heating oil on aeroplanes.
Radiators for heating dugouts.
Water heaters for dugout work.
Glue pots for automobile machine shops.
Soldering irons for automobile machine shops.
Sterilizers for hospital work.
Rivet heaters for ships and tank work.
Heating observation balloon cars.

In the issue of the ELECTRICAL REVIEW of June 29 will appear the third and final installment of this article. The last installment will deal with advertising industrial electric heating by central station and manufacturer and their co-operative effort for reaching the prospective customer.

# War Conservation of Power and Light

## *Program of United States Fuel Administration Affecting Central-Station Companies—Co-operation With Government a Factor—Saving of 10 to 34 Per Cent in Coal Expected*

BECAUSE of the inevitable shortage of coal next winter, all public utilities are vitally interested in the conservation program which has been formulated by the Federal Fuel Administration and which was discussed before the National Electric Light Association by Charles E. Stewart, chief of the Power and Light Division. The program, in slightly condensed form, is as follows:

The plans of the Bureau of Conservation of the United States Fuel Administration will be developed under the following subdivisions:

(1) Elimination of uneconomical isolated plants.

(2) The application of the skip-stop to railways and the regulation of car heating and lighting.

(3) Economy in utilization of power and light in factories.

(4) Utilization of excess water power and interconnection of power systems.

(5) Limiting the production of power to the most efficient plants available.

(6) Economy in the refrigerating and ice-manufacturing industry.

A brief statement with respect to each of these subdivisions is developed below.

The plans will be carried out through the co-operation of the following:

First. A force of engineers organized and stationed with the Fuel Administration at Washington.

Second. The engineering department of the United States Geological Survey.

Third. The power division of the Council of National Defense.

Fourth. A state fuel engineer attached to the office of the State Fuel Administrator, to supervise the activities in this state.

Fifth. The public service commissions and state regulatory bodies.

Sixth. The chambers of commerce and similar representative business bodies.

Seventh. Volunteer engineers located throughout the country.

The following gives the scope of the subdivisions:

ELIMINATION OF UNECONOMICAL ISOLATED PLANTS.

The individualistic way in which fuel is now consumed in cities is not efficient. A ton of coal burned in a large central station will produce at least four times as much electric power as when burned in the average small plant, and if centralized burning could be introduced to a greater extent, the amount of fuel required could be largely reduced without reducing in any way the ultimate production of light and power.

It is frequently the case that in buildings where electric plants are located and where exhaust steam is utilized in the heating of the building and in furnishing hot-water requirements, such buildings can adopt central-station service without a loss of money and at a saving in fuel.

As a rule, it may be stated that where no extensive heating system is operated in conjunction with the generating plant, such a plant can purchase power at a great fuel saving and with a possible reduction in power cost. In other cases it would be more economical, from the viewpoint of fuel saving, to utilize central-station service in conjunction with isolated electric plants.

It is the duty of the Fuel Administration to devise means for securing a curtailment in the use of fuel in ways which will impose a minimum of hardship. It is believed that there are many plants throughout the entire country which, at least temporarily, shut down their own electrical machinery and purchase power from others at a financial advantage to both parties and with a considerable saving in fuel.

The Fuel Administration believes that if even a comparatively small proportion of the plants throughout the country which could save fuel in this way at a profit to themselves would do so, it would prove a tremendous help in meeting the fuel situation with which the country is confronted, and in winning the war.

While it may appear that the interests of the central station are being benefited to a large degree, such is not of necessity the case. In some cases, central stations may be shut down. In any event any connection between a central station and a building or a manufacturing plant that is affected, will, of necessity, be for the period of the war only or through the period where the coal situation is critical. The machinery of the isolated plant can be readily preserved through this period of necessity. Under these circumstances the heavy expense attendant upon the making of the connection by the central station may completely or even more than offset any profit which could be expected of such a load through a short period.

APPLICATION OF "SKIP-STOP" TO STREET RAILWAYS.

One of the most promising methods by which we are securing economy in the use of fuel throughout the country is by the introduction of the "skip-stop" system on the electric railways of the various cities.

With the present practice of having cars stop on signal at any street corner, there are usually from 12 to 14 stopping points per mile. With the skip-stop system, properly applied, these are reduced to not more than 8 per mile in the business districts, 6 per mile in residence districts, or 4 per mile in the open country. With the number of stopping points decreased in this way, a saving of from 10 to 15 per cent can ordinarily be effected in the power (and hence in the fuel) required, while at the same time the average speed of the cars is increased (without any increase in the maximum speed) and the service thus improved. Since this measure secures economy in fuel not only without handicapping the service, but with an actual improvement, it is obviously an extremely desirable type of conservation measure.

Our plan is to secure the adoption of the system by voluntary co-operation between the railway companies and the various municipal authorities or state commissions and to bring about this co-operation through the federal fuel administrators for the several states. These administrators are all men of influence in their

communities and so far we have found in every case that a request from the state administrator to the proper authorities was all that was necessary to secure permission for the introduction of the system as a conservation measure during the war. With permission thus provided for, the railway companies have all been glad to adopt the plan.

### Economy in Utilization of Power and Light in Factories.

The United States Fuel Administration is requesting, as a means of accomplishing power and light conservation in manufacturing and industrial establishments, the appointment by the management of a shop committee, composed of those best suited for the purpose and in size or number suitable to the size of the plant, one member of this committee to act as its chairman. The committee is to be active with, and have charge of all details in, the operation of the plant that would in any way contribute to economy in fuel, and report weekly to the management or head of the plant. It is also suggested that this committee be changed from time to time, so that the spirit and interest in this work may be maintained.

It is not the purpose arbitrarily to outline in detail the method for doing this work, rather to suggest in a general way, leaving the details and adoption of the plan in the hands of the manufacturers interested, as we realize that conditions in different plants and character of manufacture, as well as organization, will have a bearing on the size, character and details of the committee, which must be suited to the particular case under consideration.

As a typical illustration of possible waste and opportunity or conservation, we suggest the following items: 1. Lights being unnecessarily burned. 2. Lamps of too high candlepower. 3. The elimination of carbon lamps in favor of Mazda lamps where practicable. 4. The elimination of arc lamps and substitution of nitrogen-filled lamps which are from two to three times as efficient. 5. The restricted use of sunlight due to dirty windows. 6. Operation of motors when machinery is idle. 7. Excessive sparking, heating or erratic speed of motors. 8. Improper alignment of shafting. 9. Grouping of machines so as to operate motors, or engines as nearly loaded as possible. 10. Staggering of operations so as to maintain as flat a load curve as possible. 11. Slipping belts. 12. Dry bearings. 13. Overheated or underheated parts of plant. 14. Excessive drafts due to lack of proper protection about openings of doors, windows, elevator and staircase areas. 15. The reduction of elevator service or the application of a skip-stop to elevator service. 16. The testing out of power circuits for relationship of capacity to load carried. 17. The paralleling of power circuits.

We also suggest that the work of this committee be conducted in such a manner as to provide records of savings, which could be incorporated in reports and information desired from time to time as to the progress of this work.

The War Industries Board and the United States Fuel Administration are laying particular stress on the assistance that can be rendered by industries in economizing in the use of fuel and power.

For the purpose of recognition of the individual service and interest of the members of committees, the Government will designate and identify them with a button or badge which will be furnished by the United States Fuel Administration.

The endeavor to bring about conservation by the above means is well under way in several sections of the country. Reports which have come in show savings in fuel ranging from 10 to 34 per cent.

### Utilization of Excess Water Power and Interconnection of Power Systems.

A method of fuel conservation which promises a certain amount of immediate relief and at the same time opens up a field with almost limitless possibilities for future development is the interconnection of the present power systems of the country, and the consequent utilization of considerable excess water power which is at present available.

In many parts of the country duplicate transmission systems exist, serving practically the same territory. An interconnection between these systems for the mutual exchange of energy would in many cases result in marked economies. In other cases, the lines of a power company which derives all, or nearly all, its energy from water power, may extend very close to the lines of another company which uses coal to a large extent for the generating of power. Since no company is so fortunate as to be operating with a 100 per cent load-factor, there are necessarily times during light load, when the water-power company is forced to allow unproductive water to flow over its dam. At such a time a great saving in fuel would be effected were the two companies tied together and the load on the steam station transferred in part, or entirely, to the water-power plant. Numerous hydroelectric companies have for a long time been carrying out this idea within their own systems, where the bulk of their power is derived from water and at the same time they maintain a steam reserve to carry their load during low-water periods.

In some cases these system-interconnections would involve a considerable expenditure of both time and money, in which event they would not be subject to immediate aggressive action by the Administration but would be held in abeyance as possibilities for future consideration and developments. In a great many instances, however, very considerable savings can be effected with a minimum of delay and expense, and it is along these lines that the first efforts will be most energetically directed.

### Limiting Production of Power to Most Efficient Plants Available.

We have been able to locate nearly 500 instances throughout the country where there exists, in one form or another, a duplication of power production and supply. In other words, there are communities where two or more central stations are furnishing electrical energy with systems paralleling one another.

In certain instances the results of such a condition are not serious and in many cases probably unavoidable. Our investigations so far, however, have proved that a very large percentage of these situations offer an opportunity for large fuel conservation.

We find very often that an arrangement can be made at little or no expense whereby paralleling systems might be connected and the entire load supplied from the more economical station. In some cases, possibly, the combined load of both systems would be greater than could be handled by the more economical station. In such case, as much load as possible should be carried by the station having the highest efficiency and the remainder taken by the other.

In co-operation with the Joint Commission on Refrigeration, which was organized to assist the Government during the war, the Power and Light Division is

planning to get in touch with the entire ice industry to introduce a number of proved economies in the operation of ice and refrigerating plants.

A number of suggestions have already been made by the Commission and by individuals connected with the industry. One plan that possesses merit and has possibilities of considerable fuel saving is that of allotting a definite amount of coal to individual plants, depending upon the size and type of plant, such allowances being based upon a reduction of 10 to 15 per cent of the average present fuel consumption. This will make it necessary to adopt many simple measures of economy that are now being overlooked.

Another possibility is that of producing white or opaque ice at a fuel saving of 5 to 20 per cent. This is accomplished by eliminating the power that is used for agitation in raw-water plants and for producing distillate in distilled-water plants, both of which are merely means of producing a transparent product. This measure is possible of adoption in many territories.

A further line of effort which will be productive of considerable economy and one that was successfully applied last winter, is that of operating during the winter season only the most efficient plant, or plants, in communities where, during the summer season, all plants are required. This can be done and the individual business of each manufacturer will not be interfered with as the arrangement provides that the operating plant or plants will sell at wholesale rates to those manufacturers whose plants are temporarily closed down.

This arrangement also produces a saving in ammonia, and for this reason was applied last winter at the request of the Food Administration.

In general, as regards the program outlined above, other important measures of conservation will be effected.

First: By the closing of plants or the consolidation of plants there will be rendered available skilled men who are vitally needed in the many war industries of this country. Provisions are now completed whereby men with such training will be assisted in obtaining profitable work suitable to their ability.

Second: In many parts of the country there exists at the present time a power shortage. The interconnection of systems, the diversity-factor of these systems considered, will render available additional quantities of power. The Council of National Defense is examining all communities where there is a surplus of power, having in mind the possible establishment of such communities of industries.

It may be stated that the conservation efforts of the Fuel Administration along the above lines are being directed so as to best serve the interests of all with a minimum of inconvenience and cost and with the object of making the coal supply that is available go as far as possible, so as to prevent the necessity of further drastic measures, such as were necessary in January.

It will be patent to every reader that in the face of a great potential shortage it would be criminal for the Fuel Administration to neglect obvious means of fuel saving, such as outlined above, and equally criminal for the individual plant owner to refuse or defer co-operation which may have as a direct result a loss in production of war materials or which may jeopardize the health of many families through shortage in coal supply. The Administration believes it should not be necessary to resort to the issuing of orders for the adoption of these conservation measures, but is relying, as in the past, upon voluntary action by those concerned and does not wish to enforce the measures where the saving in fuel would result in hardship to the owners not commensurate with the benefit derived by the public.

## SECRETARY DANIELS ADDRESSES GENERAL ELECTRIC EMPLOYES.

**Tells Skilled Workers Their Co-operation Is Needed and Their Place Is in the Factory.**

In his tour of inspection throughout the Empire State, Secretary of the Navy Josephus Daniels visited the Schenectady Works of the General Electric Company, Saturday, June 15. Accompanied by national and state officials, Secretary Daniels inspected the work now being done at the Schenectady plant for the United States Navy Department, paying particular attention to the turbine and turbine gears for destroyers and to the electrical equipment for battleships.

At noon Secretary Daniels addressed the 23,000 General Electric employes and in the course of his remarks he said: "And I want to say to you men, you skilled laborers, you turbine builders, you constructors of gears and electrical apparatus, your place is here. Gentlemen, every day you turn out more and better equipment for our army and navy, you are as truly fighting as those brave men in the mud and glory of France."

Included in the secretary's party were Governor Charles S. Whitman and his military secretary, Major Hoppin; Lieutenant Governor Schoeneck, Speaker

**Secretary Daniels Addressing General Electric Employees at Schenectady.**

T. C. Sweet, George P. Pratt, head of the Conservation Commission; Colonel William P. Dauchy, commander of the State Militia; Major George F. Chandler, head of the State Constabulary, and ex-Governor Martin H. Glynn.

# Effect of War Upon Public Utilities

## *Review of the Serious Difficulties Confronting Utilities Due to Increased Costs—Need for Speedy Relief Through Higher Rates—Abstract of Paper Before Missouri Association of Public Utilities*

By H. WURDACK

*President, The Light & Development Company, St. Louis.*

OUR WORLD civilization as it existed in normal times preceding the great world war was the result of centuries of constructive effort to establish a system of international, national, civic, and individual relationship, which would best serve and promote the welfare of the nations, states, cities, communities, and individuals, forming the great world commonwealth. The greatest advantage was secured by those whose constructive ability and genius predominated in the long and tedious constructive process. This great system of world relationship has been constructed by utilizing every known advantage of education, art, science, invention, discovery and developments, by harnessing the forces of nature, extending and utilizing all of its resources, and in fact by pressing into service everything that would add in the least to the sustenance of human life, to its comfort or its well-being.

It is no wonder that a system so built on a basis of co-operation and co-ordination should be disturbed in every branch by the changed conditions brought about by a great world war, which in its very essence is the breaking down of human relationships, political, social, and commercial, and is a complete reversal of the normal, constructive, co-operative plan, into one of destruction.

No industry in our country is more closely bound to the public need than is the public utility industry, comprising as it does, the manufacture, distribution, and delivery of electricity, gas, water, telephone, telegraph, as well as street-railway and interurban-trolley service. These forms of public utilities have become so closely bound up with our civilization that they are absolutely indispensable, and it would be impossible to imagine the calamitous results that would follow the failure or breaking down of these utilities. It is evident, therefore, that an industry of such tremendous importance should feel the terrific shock of the complete and sudden change in our political, commercial and economic system, and it naturally follows that, if these industries are to survive, it will be possible only by radical adjustments designed to meet the changed conditions in our economic affairs.

Our business structures must adjust and right themselves to the changing conditions of these days as completely as have our political and social relations. For convenience let us look at the conditions under which our utilities are being developed, or were built up from the earliest days of their beginning.

### Essential Factors in Utility Development.

The very nature of the utilities industry involving large outlays of money (as money or capital is a prerequisite to any development) demands as a first step that every utility project be predicated on provision of sufficient money or capital to provide the necessary equipment for service.

The second step in the development of the utilities industry is the production of machinery and appliances for the manufacture and utilization of the commodity to be sold.

The third requirement is that of intelligent coordination of skilled management and labor to insure purpose and efficiency in construction and operation.

The fourth necessary items are fuel and supplies, as part of the manufacturing and maintenance requirements.

The fifth items are fixed charges and taxes.

These five items comprise the essential factors necessary in formulating a rate column that will equitably provide the charges for service, and from decade to decade (with rare exceptions) these factors have been realized by utilities on increasingly favorable terms.

First—Capital, while at first skeptical and uncertain, became more and more liberal; and in the period just previous to the war, money was furnished to utility properties at rates of interest ranging from 4 to 8 per cent, dependent on the locality, size and hazard of the particular enterprise.

Second—Machinery and appliances have steadily improved in efficiency and reduced in cost, so that their utilization worked to the complete and increasing advantage year by year of the utilities requiring them.

Third—Management and labor has grown more proficient and experienced, which, combined with labor-saving devices, has tended to decrease labor cost per unit of output.

Fourth—Fuel and supplies during the pre-war period, if not falling in prices, were at least not increased, and were fairly stable, and formed a substantial basis on which to fix rates.

Fifth—Taxes and fixed charges had during the pre-war period remained at least normal per unit of output.

The use of the commodity had increased year by year until it seemed that almost any hardship or obstruction upon the utilities by taxation or legislation could be absorbed in the growing system and vigor of the industry. Under these conditions, the system of regulation by legislation, though economically unsound and commercially destructive, seemed quite reasonable to the legislator, and during the period of normal conditions regulation, though often working injustice and hardship, continued with more or less success in spite of the fact that the system was designed principally to work well enough for increasing expenses and reducing rates, but is found to be an impractical mechanism for reducing expenses and increasing rates. It is but natural, therefore, under the changed conditions in which the utilities find themselves, that our system has broken down because of the great world war, and many of our public utilities are now on the verge of bankruptcy and destruction.

Let us see how and why some of the changes brought about by the war affect our utilities.

penses, with no return whatever on investment, and these communities, while not representing the largest part of the aggregate capital invested, do represent by far the largest number of utilities. This condition not only affects the income revenue of the utilities, but also their credit and financing ability.

Table B shows the effect of the war conditions on market value of stock of a number of the largest companies.

It must be borne in mind that with the increase in cost of all essentials, especially of labor and fuel, there is an added decrease in efficiency of fuel alone of 5 to 20 per cent, and due to the nature of the impurities added in the process of "stimulating coal production," the utilization value of the coal has been further reduced from 10 to 30 per cent, while the price has increased from 90 to 200 per cent per ton.

Our National Government has drawn on our utilities for many of our most highly skilled technical, commercial and operating men, as well as our quota of the rank and file, amounting to approximately 12 per cent of the men employed. To this must be added the loss of employes to more prosperous industries which can pay from 100 to 200 per cent larger salaries than utilities.

## Relieve the Utilities From Excessive War Burden.

From all parts of our country comes a warning call for relief. The warning sounded in the correspondence of President Wilson, Secretary of the Treasury McAdoo, and Comptroller of the Currency Williams, is too well known to be repeated here.

The note of alarm sounded by Max Thelen, president of the Railroad Commission of California, in his address of March 6, 1918, before the University of California extension course, is shown by the following excerpts:

"In the situation which now confronts many of our public utilities, the duty of the state commissions is clear.

"The state commissions should not wait until the utilities come to them with their pleas for assistance. It is their duty to inform themselves by their own investigations, if necessary, concerning the condition of the public utilities under their jurisdiction and to keep themselves constantly informed.

"If the state commissions rise to meet the situation, as they are doing in all sections of the country, they will be rendering a substantial service not merely to the utilities and their patrons but also to the nation itself which is largely dependent for war efficiency on the service of public utilities."

For the purposes of analysis we will divide the utilities into three classes:

1. Those known as the more prosperous utilities and located east of Indiana, now serving the principal *war industries,* and their normal pre-war consumers.

2. The utilities in larger cities, situated mostly west of Ohio, and serving principally *essential industries* and their normal pre-war consumers.

3. Utilities located in and serving communities of 15,000 population and under and furnishing service to a great number of *contributing industries,* and their normal pre-war industries.

In Class 1 it may be of interest to know that 95 per cent of the *war industries,* such as munition works, shipyards, ordnance works, etc., receive their *entire* supply of light and power from public utilities companies.

The following figures will show the amount of power supplied to war industries in a few of the various districts:

| | |
|---|---|
| New Jersey district | 260,000 horsepower |
| Philadelphia district | 600,000 horsepower |
| Pittsburgh district | 500,000 horsepower |
| Detroit district | 350,000 horsepower |

In Class 2, comprising some war industries and mostly essential industries, such as flour mills, cotton and woolen mills, shoe factories, etc., more than 80 per cent of the entire light and power for operating these industries is furnished by the utilities companies.

In Class 3, which serves some war industries and some essential industries, but mostly contributing industries, such as spoke mills, small flour mills, shoe factories, saw mills, machine shops, clothing factories, etc., over 75 per cent obtain their entire supply of light and power from the utilities companies.

## Conclusions.

1. Regulation will only be tolerated by the American people so long as it seems to work to their advantage.

2. Laws and limitations made in peace times and to govern peace conditions are in very many cases found to be wholly inadequate, improper, and inoperative in war emergency. For instance, our Federal Government found that the anti-trust, interstate commerce and state commission laws made to govern and regulate our railroads in times of peace, proved unworkable in war times, and by taking over the railroads, offered protection against the anti-trust laws, by guarantee of earnings reimbursed the railroads against deficiencies in the regulatory system of commissions, and by federal directors eliminated the destructive results of regional, state and community prejudice and jealousies.

3. Our commissions, local authorities and communities (especially of our central and western states) must allow liberal and speedy remedy, if total destruction of our utilities is to be averted.

## Remedies.

1. Speedy relief by allowing increase in rates and charges sufficient to reimburse the utilities for losses already sustained as well as to provide for increase in cost of labor, fuel, supplies and taxes.

2. Relief from all unnecessary extension, improvements, and burdensome provisions of street paving, undergrounding, painting, as well as disproportionate taxation.

3. Provisions for some means (at reasonable rates and terms) for financing necessary extensions, needed improvements, and refunding maturing obligations.

In other words, the public utility industry, if it is to continue, must be put upon the same basis as other large, reputable business industries, and must be allowed latitude for readjustments, as free from onerous regulation and legislation as is the iron industry, the milling industry, the shipping industry, the shoe industry, or any other reputable business necessary to the happiness and well-being of our people. It is self evident that all obstacles, antagonisms, onerous restrictions, as well as expensive rules, unreasonable hardships, disproportionate taxation, and the like, must eventually work to the detriment of the industry, and through that industry to the detriment of the consumer for whom the industry is created and operated. Conversely, the success, prosperity, progress, and development of our industry must accrue to the benefit and advantage of the country, community and consumer for whom, after all, the utility companies and managements are but trustees.

First, in the matter of capital, which is a prerequisite to every utility's development, we find that due to war conditions, securities have depreciated, interest and discounts have increased, and the purchasing power of a dollar has decreased, thus reducing money in value, and increasing its cost to unheard of proportions.

Only recently, one of the largest utility companies in this country found it necessary to refund with two-year notes, maturing obligations in the neighborhood of $10,000,000, and was compelled to pay in interest and discounts, at a rate of interest aggregating 13 per cent per annum.

Utilities, which in the pre-war period, could borrow money at interest rates of 4, 5 or 6 per cent, have been compelled to pay 11, 12 or 13 per cent, and in many cases, have been unable to get funds even at these prices, while the smaller utilities have been practically shut out of the market entirely.

Second, machinery and appliances have increased in cost from 75 to 200 per cent, and in many cases have decreased in efficiency and durability, thus inflicting additional expenses and hardship on our utilities.

Third, labor, due to the scarcity of man power, has increased from 35 to 60 per cent, and due to the fact that many of our very best and most talented men have been called into the national service, the remaining labor has decreased in efficiency and dependability.

Fourth, fuel and oils have increased from 100 to 200 per cent in cost per unit, and coal has decreased in efficiency or heating value per pound from 10 to 30 per cent. In many cases of actual experience, the fuel cost per unit of output has been increased since the war from 200 to 300 per cent. Copper, lead, zinc, iron, and all supplies have increased from 75 to 300 per cent, with no increase in efficiency.

Fifth, taxes have increased from 50 to 300 per cent, depending on the needs of the communities, and the desire of local authorities to replenish depleted treasuries.

In short, due to war conditions, everything that enters into the production of utility service has increased from 50 to 300 per cent, which with multiplied burdens in every other line calls for assistance that cannot be ignored.

It may be of assistance to our understanding of the magnitude of the utilities industry and its tremendous importance in our national war program, as well as to show the needs confronting the utilities, to exhibit some figures showing the magnitude of the investment, together with their increased expenses and obligations.

TABLE A.

| | |
|---|---|
| Approximate annual gross earnings of electric light, power, street-railway and gas companies in the United States | $1,500,000,000 |
| Approximate operating expenses and taxes | 975,000,000 |
| Approximate net earnings | 525,000,000 |
| Capital stock, preferred | $1,737,916,000 |
| Capital stock, common | 4,468,952,000 |
| Total stock | 6,206,878,000 |
| Amount of stock on which dividend was based in 1916 | 4,321,228,000 |
| Approximate total bonded debt (notes payable) | 5,143,765,000 |

Average return on capital (stock and bonds), based on 1916 operations, is shown to be a little less than 5 per cent for 1916.

These industries consume annually approximately 51,500,000 tons of coal and employ approximately 540,000 persons at a total salary of approximately $520,000,000.

Three hundred and sixteen of the best and most prosperous of these utilities showed an increase in operating expenses for the three months ended November 30, 1917, as compared to the same months in 1916, of 7 per cent, or $105,000,000.

This loss of net revenue would, of course, be slightly offset by increase in gross revenue, due to increased business, which, however, required additional investment on the basis of present costs, which are 100 per cent above normal. The approximate increase in gross and decrease in revenue for the three-month period ended November 30, 1917, over the same months in 1916, is as follows:

| | |
|---|---|
| Increase in gross earnings | $228,968,700 |
| Increase in operating expense | 290,295,640 |
| Decrease in net | 61,956,940 |
| Increase in investment | 650,080,000 |

Basing the figures on an equal group of those not so fortunately situated and excluding the hydroelectric and coke-oven plants, which we will call Class 2, we find conditions more nearly representative of the average utility, which shows an increase in operating ratio of approximately 20 per cent, or an increase in operating expenses of from $975,000,000 to $1,275,000,000, and a shrinking in net for the same service from $525,000,000 to $225,000,000, leaving barely enough to pay 5 per cent interest on the aggregate bonded debt of the utilities.

If we pass from the second to a third class of utilities, namely: those in the smaller communities of from 15,000 inhabitants down, which we will call Class 3, we find a still greater increase in the operating expense ratio. This amounts in many cases to a complete absorption of all gross income to meet operating ex-

TABLE B.

Shrinkage in the common capital stock of 17 leading public utility companies from the high prices in the last five years to the present low level.

| Name of Company. | Outstanding common capital stock. | Highest price in last five years. | Value on basis of present capitalization and highest price reached. | Recent lowest price. | Value on basis of present low price. | Percentage of shrinkage to common stock. | Shrinkage shown by multiplying given decline by present capitalization. |
|---|---|---|---|---|---|---|---|
| American Gas & Electric Co. | $ 4,020,350 | 316 | $ 12,704,306 | 170 | $ 6,834,595 | 146 | $ 5,869,711 |
| American Power & Light Co. | 8,705,400 | 90½ | 7,878,387 | 35 | 3,046,890 | 55½ | 4,831,497 |
| American Light & Traction Co. | 18,681,000 | 450 | 84,064,500 | 178 | 33,252,180 | 272 | 50,812,320 |
| Boston Elevated Railway | 23,879,400 | 114¼ | 27,282,214 | 27 | 6,447,438 | 87¼ | 20,834,776 |
| Brooklyn Rapid Transit Co. | 74,455,159 | 94¼ | 70,173,989 | 36 | 26,803,857 | 58¼ | 43,370,132 |
| Commonwealth Edison Co. (Chicago) | 45,838,900 | 155 | 71,050,295 | 100 | 45,838,900 | 55 | 25,211,395 |
| Commonwealth Power, Railway & Light Co. | 18,585,900 | 65 | 12,080,835 | 30 | 5,575,770 | 35 | 6,505,065 |
| Consolidated Gas Co. (New York) | 99,816,500 | 150½ | 150,223,832 | 76½ | 76,359,622 | 74 | 73,864,210 |
| Detroit Edison Co. | 25,977,400 | 149 | 38,706,326 | 104 | 27,016,496 | 45 | 11,689,830 |
| Edison Electric Illuminating Co. of Boston | 22,528,000 | 288½ | 64,993,280 | 133⅛ | 29,990,400 | 155⅝ | 35,002,880 |
| North American Co. | 29,793,300 | 81½ | 24,281,559 | 39 | 11,619,387 | 42½ | 12,662,152 |
| Northern States Power Co. | 6,170,000 | 107 | 6,601,900 | 50 | 3,085,000 | 57 | 3,516,900 |
| Pacific Gas & Electric Co. | 34,035,858 | 68¾ | 23,399,653 | 33 | 11,231,833 | 35¾ | 12,167,820 |
| Peoples Gas Light & Coke Co. | 38,500,000 | 129¾ | 49,761,250 | 25 | 13,475,000 | 94¾ | 36,286,250 |
| Public Service Co. of Northern Illinois | 11,573,900 | 118¼ | 12,686,136 | 71 | 8,217,469 | 47¼ | 5,468,667 |
| Republic Rwy. & Light Co. | 6,206,000 | 56 | 3,475,360 | 17 | 1,055,020 | 39 | 2,420,340 |
| United Light & Rwy. Co. | 6,900,100 | 55 | 3,795,055 | 24 | 1,656,024 | 31 | 2,139,031 |
| Total | $475,667,167 | ..... | $664,158,857 | ..... | $311,505,881 | 74⅛ | $352,652,976 |

Note—Percentage of shrinkage to value on the basis of present capitalization and highest price reached is 53.1 per cent.

# Editorial Comment

## Let The Isolated Plant Do Its Best

INTERCONNECTION, in its all phases, was one of the subjects of paramount importance discussed at the N. E. L. A. convention. Not only was it recommended that interconnection amongst utilities and amongst various plants continue at a more rapid rate, but it seemed the consensus of opinion that the time has come when many so-called isolated plants should be physically connected to permit interchange with public service systems and that such interconnection might be made compulsory unless done willingly by the parties concerned.

And why not? A private plant is often able to generate electricity cheaper than it can buy it, partly because the plant is efficient, partly because the utility rate is not what it could be perhaps, and partly because the cost of transmission between power house and customer is so high. Moreover, it often has more than it wants and frequently as a by-product. There are many cases where so-called isolated plants of a few hundred horsepower serving hotels, large down-town buildings and factories with heating and light are operating in parallel with the utility with more than 100,000. The gain is small, but it is mutual. The isolated plant is able to shut down when it wants without affecting the lighting. At time of peak locally it is able to feed current into the network. These plants are usually closely allied with the utilities financially, directly, or indirectly, however. But why discriminate between isolated plants in such times as these?

If our cities could spring up over night now instead of having slowly developed on more or less haphazard lines, the conglomeration of isolated plants for heating and divers other purposes that now exist in the midst of a territory served by efficient electrical and heat systems would be absent. There are a few cases where a city has been born again as it were—the case of Dayton comes to mind—where the isolated plant is a rarety, where the city is practically smokeless and where conditions are just as they should be. Unfortunately, this cannot be the case in most instances, hence many isolated plants must go, but many should remain.

Many reasons have combined to prevent central station and isolated plant from linking up.

At present the charges for stand-by service are often such that the isolated plant finds them impractical. On the other hand, the utility feels disinclined to furnish a rival with the wherewithal to maintain its reliability or reduce its costs. The isolated plant is its rival, not its co-partner; something to be put out of business rather than helped. Thus enmity instead of friendship, isolation instead of reciprocity, have been fostered.

Physical connection and interchange of power gives the smaller systems a stand-by or reserve source of supply, improving their service and increasing their status and prestige amongst their customers. This the larger system does not wish intentionally to permit. Moreover, if this same stand-by service were purchased according to scheduled rates, the price would be very much more favorable to the larger system.

Another complicating factor that has loomed up in more than one instance is that when energy is retailed by two respective utilities serving the same territory. When physical connection permits interchange of energy, there is the possibility of the smaller utility retailing some of the energy purchased at wholesale from the larger utility, thereby making a profit that the larger utility might have made and even obtaining customers it otherwise could not who would eventually have connected up to the system of the larger utility. In this case also the smaller gains at the expense of the larger utility.

These are only some of the vexing problems and influences at work that first come up tending to slow down interconnection and handicap wholehearted co-operation and co-ordination amongst interests not financially close together, to the detriment of the public and country as a whole. There are many other phases, of course, some physical, some financial, some social, some political.

The isolated plant has its place just as much as the central station, only it is more restricted. To abandon many an isolated plant would be foolhardy and an economic crime. These are the exceptions, of course. Coal conservation or anything else, even the German foreign trade, cannot exist and succeed unless founded upon an economically sound basis. There is many an isolated plant that should not be supplanted by central-station service on the basis of cost, delivered or at the coal pile.

But if the welfare of the country now and in the future requires linking up of central station and isolated plant, petty jealousies and big-business policies must be put aside voluntarily or otherwise.

## Importance of the District Associations of Contractors and Dealers

MANIFESTLY, the real results to be attained by electrical contractors and dealers, by way of putting the Goodwin Plan into effect, must come through the district associations. The main objective is to make the contractor and dealer a couplet in electrical service, not only to do house, store and factory wiring, but to sell appliances and supplies to users. The special need is to so enlarge the merchan-

dizing feature that the concern will be recognized as the logical channel through which electrical supplies and appliances may be distributed.

The contracting and merchandizing branches, while necessarily conducted as separate departments, may be co-ordinated in rendering the service that customers want. While there are many examples of concerns which have built up the two branches to a stage of efficiency and profit, the industry as a whole has no effective grasp on the merchandizing branch. The result is that much of the electrical trade is handled by stores and agencies not allied to the electrical industry.

The co-operation necessary to turn this line of merchandizing into electrical contractor-dealer channels must be secured through the district associations. In such associations the members soon learn to put aside those antagonisms due to business rivalry and suspicion, to clear the atmosphere for the consideration of their mutual interests. The association function is to maintain prices, based upon accurate cost data both as to installation work and merchandizing; to promote working relations with the jobber and manufacturer as to the proper margin to dealer and contractor; to co-operate with the power producer, remembering that, primarily, his business is to sell energy; to study merchandizing methods, to develop the electrical idea among customers, and advance the practice of selling service in both contracting and merchandizing.

The state association is essential in promoting the movement as a whole, but the district organizations are the effective units to which we must look for practical results.

---

## *Improving the Power-Factor*

LOW power-factor is a thing nobody wants. Power-factor improvement is one of the improvements that must be made in keeping with the effort now being put forth to conserve capacity, save fuel and raise generally the efficiency of generation, transmission, transformation and utilization of alternating-current energy.

The effect of low power-factor in heating up of generator and transformer windings and cables, interfering with voltage regulation and imposing limitations as to safe loading of apparatus, and the consumption of coal necessary to generate this so-called wattless current are well known. The heavy loads and overloads central stations are now called upon to carry, the shortage of capacity and the need for saving coal gives the subject of power-factor improvement added incentive at this time, therefore. The use of the synchronous motors to compensate for the wattless components is equally well known and finds wide usage. But it is advisable to prevent low power-factor rather than to cure it.

In the ordinary industrial plant low power-factor is usually due to the use of induction motors either too large for their work, motors running lightly loaded, use of slow-speed motors where high-speed would be just as feasible and infinitely more preferable, and the use of a number of small motors—often all of them underloaded—instead of a few loaded up.

The power-factor of an induction motor depends upon the relative magnitude of leakage and magnetizing current. For a given motor the magnetizing current, in per cent, is directly proportional to the square of the voltage, so long as the iron is not worked at saturation; the reactance or leakage is inversely proportional to the square of the voltage. Good voltage regulation, and the maintenance of voltages not higher than rated motor voltage help the power-factor, therefore. Good regulation of frequency also is desirable, not for speed of motor alone, but for power-factor also, because low frequency is accompanied by low power-factor.

Energy charges based upon connected load tend to discourage over-motoring and the lower power-factor chargeable to this cause. A power-factor clause in power contracts, a sliding scale that penalizes for power-factors below those specified, and rewards for those above makes the customer a partner in receiving the benefits of high power-factor. Many central-station companies now recognize the wisdom and justice of the power-factor clause in power rates and have adopted it. And state utility commissions are beginning to endorse it.

Restrictions placed by central stations through the N. E. L. A. several years ago upon the starting current of single-phase motors operated from lighting circuits were instrumental in bringing about pronounced improvements in the design of this class of motor. Penalization for power-factors such as result from poor design or improper application should do much to better conditions as they exist in the majority of cases today. The trouble may be with the motor, but more probably is it with the application, and in this the central-station company is well able to remedy matters. An over-motored installation is often due to a motor having been chosen for possibe future needs. It may be due to ignorance on the part of the purchaser or over-zealousness on the part of the motor salesman. And herein the central station, with its knowledge of industrial requirements and its stock of portable measuring instruments and men to use them is often well able to be of assistance to the customer as well as its own cause. Whether the motor is furnished through the utility or otherwise and more preferable way perhaps matters not, so long as the motor is the motor for the job.

The only way, as conditions now exist, for radically improving the individual power-factors of a system is to make it worth while for customers to maintain their power-factor as high as possible. And the way to do that is to have the power bill vary with the power-factor. The correct motor in the right place, proper loading and choice of motor drive, and even the use of corrective apparatus will then come naturally, saving fuel and increasing capacity.

# Week's Events

## *Chicago Sanitary District Receives Pump Station Bids—Engineering Council Seeks Committee Help—Other News*

### TO ELIMINATE APPRAISAL OF ELECTRIC PLANTS IN RATE INCREASES.

**New York Public Service Commission Has Adopted Uniform Plan for Granting Temporary Relief.**

To avoid the expense and inconvenience of making appraisals of electric plants under war conditions for deciding rate cases, the New York Public Service Commission has adopted an equitable basis for the consideration of all applications from public utility companies for permission to increase light and power rates. The Commission's ruling is that when a temporary increase in rate is asked to cover the war period, and which will yield the company no greater return than was earned prior to the war, the application will be considered as follows:

Where no change in relations between classes of consumers or localities is concerned, and the increase is only sought to cover an emergency period, the commission need not enter upon a regular rate proceeding with a reappraisal of the corporate property. Except where substantial reason appears for belief that a public utility company is concurrently earning more than a reasonable return upon its investment, the Commission will refrain from conducting rate cases in the usual formal fashion during the period of the war, and may devote itself to the ascertainment of the relief necessarily to be granted to prevent the breaking down of service and lasting detriment of the property. Except where substantial reason appears for a contrary course the Commission is of the opinion that it need not, in awarding emergency relief, inquire fully into the normal valuation of the corporate property.

The following questions will be considered in determining the rulings to be made in the applications:

(1) Is an increase in the rates necessary to cover operating expenses and fixed charges? (2) Is an increase in rates necessary to prevent a probable impairment of the service and a destruction of the credit of the enterprise? (3) Is an increase needed to overcome inroads made by advancing operating costs or diminished patronage? (4) What increase in income would probably result from the proposed emergency increase in rates? (5) Will the method proposed in providing for increased rates operate fairly as between localities and different classes of consumers? (6) What conditions and safeguards should be required of the company in order to insure the conserving of the corporate property and its adequate administration in wartime?

The adoption of this plan has been brought about by the application of the Queens Borough Gas & Electric Company for permission to increase its electric rate from 12 to 14 cents, and gas rate from $1.15 to $1.40. In utilizing the new method to this case, the Commission says:

An appraisal of the property of this company (The Queens Borough Company) would cost a substantial sum, which the company says would amount to $50,000. Were the company subjected to such an outlay, it would become an operating charge and thus borne by the consumers. In a time of war there should be no expenditure of money, expert skill, or materials, which does not serve the purpose of integrating these local agencies in the successful conduct of the war. To require the present depleted valuation staff of the Commission or company engineers to bend their energies for several months to a reinventory and appraisal of this company's property, at a time when unit prices for construction work and materials are so abnormally high as to be misleading and of little aid in ascertaining "value for rate purposes," would seem to involve unnecessary delay and expense and an undesirable diversion of labor and skill.

### CHICAGO SANITARY DISTRICT RECEIVES BIDS FOR ELECTRIC PUMP STATION.

**Data on Pumps, Motors and Transformers—List of Bids Submitted—Facts as to Main Structure.**

The Sanitary District of Chicago issued plans and specifications last April for the Calumet Sewage Pumping Station, the site for which is on property owned by the Sanitary District and situated on the main line of the Illinois Central Railroad, about 1100 feet north of the intersection of 127th Street and Indiana Avenue, in the city of Chicago. At the same time sealed proposals for the construction of the station and the installation of equipment therein were invited. Bids for the numerous phases of the proposed work were opened June 6 at the office of the Sanitary District, at 910 South Michigan Avenue.

#### Requirements of Building Contract.

A brief outline of the improvements is given under four divisions, as follows:

Division A relates to the building for the station, including substructure and superstructure. It is to be of reinforced concrete and brick, approximately 80 by 185 feet, and to be provided with suction and discharge basins, sewage screens, a 15-ton hand-operated crane, sluice gates and accessories. The job involves about 52,000 yards of excavating; 9500 cubic yards of concrete construction, requiring 450 tons of reinforcing steel; 165 tons of structural steel and various lines of iron castings, water pipe, tile underdrain and other supplies.

#### Pumping Equipment.

Division B, covering pumping machinery, specifies the following: Three 72-inch horizontal centrifugal pumps, each of the capacity of 275 cubic feet per second, for a head of 23 feet; these are to be provided with suction, discharge and vacuum pipes, and priming pumps. Also, three 36-inch horizontal centrifugal pumps, each of the capacity of 75 cubic feet per second, to operate against a head of 20 feet. Bids were also asked on one additional 72-inch centrifugal pump, to be installed at 95th Street and Baltimore Avenue,

South Chicago, the order for which is to be at the option of the Sanitary District.

The pumps specified are to be built after designs by A. B. Wood, of New Orleans, La., consulting engineer for the Sanitary District. The proposed installation contemplates taking up sewage direct from the inlet intercepting sewer and discharging it into the Calumet-Sag drainage canal. While the regular operations of the three 72-inch pumps are to deliver sewage from the sewer into the Calumet-Sag channel, it is so arranged that, in case of storm conditions, two of them may bypass the sewage into the Calumet River at the rate of 230 cubic feet per second, against a head of 10 feet.

### Electrical Equipment.

Division C relates to the electrical equipment, under which the following are specified: Six 1000-kilovolt-ampere, 40,000/12,000/2300-volt, single-phase transformers, and eight 2300-volt, three-phase, 60-cycle, self-starting synchronous motors, with starting compensators and field rheostats. The motors for driving the three 72-inch pumps, when operating to discharge sewage into the Sag Channel, are to be of the capacity of 1100 horsepower each, with a speed of 150 revolutions per minute. The three motors intended for the three 36-inch pumps are to be of the capacity of 300 horsepower each, and with a speed of 257 revolutions. The 36-inch pumps likewise are to take up sewage and discharge into the Sag drain. The other two motors required, each of the capacity of 450 horsepower, with a speed of 106 revolutions, are to drive the two 72-inch pumps during periods when they are operated to bypass sewage to the Calumet River. These two pumps are direct-connected by flexible couplings, each to an 1100-horsepower motor for the regular operations, as previously stated; but coupled on the opposite end of each pump shaft is one of the 450-horsepower motors. Thus, there are to be two motors connected to each of the 72-inch dual-service pumps, intended to drive the pump under different conditions and at different times. This, perhaps, will explain the necessity for having eight synchronous motors for six pumps.

Other electrical requirements consist of six 50-kilovolt-ampere transformers; two 75-kilowatt motor-generator sets, with field rheostats and starting compensators; also oil switches for controlling the synchronous motors, transformers and the two 12,000-volt incoming power lines.

### Pumping Machinery.

| Bidders. | Six centrifugal pumps lump sum. | One pump 95th St. Sta. |
|---|---|---|
| Nash-Dowdle Co. | $230,000 | $ 16,000 |
| T. J. Forschner Contracting Co. | 231,000 | 65,000 |
| Nash Brothers | 306,800 | 107,000 |
| Camden Iron Works | 254,300 | 46,000 |

### Electrical Equipment.

| Bidders. | Eight synchronous motors. | Switchboard wiring, etc., complete. |
|---|---|---|
| Nash-Dowdle Co. | $132,000 | $ 47,500 |
| T. J. Forschner Contracting Co. | 200,000 | 50,000 |
| Nash Bros. | 229,896 | 64,000 |
| Electric Machinery Co. | 120,000 | ..... |
| General Electric Co. | 123,494 | ..... |
| Westinghouse Elec. & Mfg. Co. | 131,000 | 60,923 |
| Beaver Elec. Constr. Co., Chicago | ..... | 49,495 |

### Power from Lockport Station.

Power for this pumping station will be supplied by the Sanitary District's hydroelectric station near Lockport, Ill., which has a maximum generating capacity of 32,000 kilovolt-amperes. This energy is transmitted 30 miles from Lockport to the Western Avenue terminal station in Chicago over the present steel-tower 44,000-volt lines, and will be transmitted thence over 15 miles of 12,000-volt lines to the pumping station.

The bids on the pumping and electrical equipment will be of interest and are given in the accompanying table therefore.

### Explanations.

Green & Sons Company, Chicago, made offer to do the work at cost, plus 10 per cent.

Nash-Dowdle Company bid on the project as an entirety, naming no particular pump or electrical machinery.

Nash Brothers bid on building and pumping equipment, and also on entire project, but not naming any pump nor electrical machinery makers.

T. J. Forschner Contracting Company bid on entire project, not specifying any makes of pumping nor electrical equipment.

General Electric Company submitted a letter stating that to the figures quoted an additional sum for inspector's tests should be added, viz., if at factory $1300; if at pumping station $2500.

Westinghouse Electric & Manufacturing Company submitted a letter stating bid is only on C and D divisions combined as an entirety and is subject to acceptance on or before June 26, 1918.

It is understood the bid of the Camden Iron Works, Camden, N. J., for furnishing and installing pumps and appurtenances has been accepted.

It will be noted that among the bids submitted for the eight synchronous motors, that of the Electric Machinery Company, Minneapolis, Minn., is the lowest. At the time of this writing the award for motors and other electrical equipment had not been made.

## ANNUAL CONVENTION OF IRON AND STEEL ELECTRICAL ENGINEERS.

**Twelfth Annual Meeting to Be Held September 9-14, Southern Hotel, Baltimore.**

The twelfth annual convention of the Association of Iron and Steel Electrical Engineers will be held September 9 to 14 at the Southern Hotel, Baltimore, Md. The meeting will be an important one and arrangements for a very interesting program are being made. The program of papers to be presented, which is still tentative, is substantially as follows: Papers by the Standardization, Safety and Electrical Development Committees of the association; "Methods of Education for Electrical Employes of Iron and Steel Mills," prepared by the Educational Committee; "Remote-Controlled Substation," by W. T. Snyder; "Automatic Engine Stops," by Walter Greenwood; "Standardization of the Rating of Large Steel-Mill Motors," by K. A. Pauly; "Practical Method of Selecting Carbon Brushes," by Alfred Mullhaupt, Jr.; "Bridge Motors for Cranes," by R. H. McLain; "Condensers and Condensing Engineering Practice," by D. D. Pendleton; "Roller Bearings for Cranes," by P. B. Liebermann; "Installation and Operation of Auxiliary Drives," by J. D. Wright; "High-Tension Installations Under Severe Conditions," by James Farrington; "Electrically Driven Mills, Showing Tonnages, Costs, etc.," by J. T. Sturtevant, and "60 Cycles versus 25 Cycles for Steel Mills," by J. E. Fries. John F. Kelly, of McKeesport, Pa., is secretary of the association.

## FACTS ABOUT HOG ISLAND PLANT GIVEN IN PUBLIC ADDRESS.

**W. H. Blood, Jr., Gives Highly Interesting Outline at N. E. L. A. Convention.**

One of the highly interesting addresses delivered at the N. E. L. A. convention last week was that of W. H. Blood, Jr., assistant to the president of the American International Shipbuilding Corporation, at Hog Island, Philadelphia. This address was of special importance, coming as it did from one who is in position to speak with accuracy on what has been accomplished at the Hog Island plant.

Some of the interesting matter given out related to the facilities of this plant for carrying on the gigantic shipbuilding work assigned to it. The yards eventually will have 50 shipways and seven outfitting piers with capacity to handle 28 ships at the same time. The capacity of these shipyards is equal to one-fourth the combined capacity of all the yards of Great Britain, and six times the size of our largest shipyards at the beginning of the war.

The 650 electric motors and the 40,000 electric lamps necessary to serve the shops and yards require about 3,000,000 feet of wires.

At the invitation of W. H. Blood, Jr., a party of about 75 delegates, led by President-elect W. F. Wells, of New York, and Vice-president D. H. McDougall, of Toronto, visited the shipyards at Hog Island, near Philadelphia, on Saturday morning. The party left Atlantic City at 10 a. m. and were met at Philadelphia where they were conveyed by tug to the shipyards.

A fine luncheon was served at the yard and at 4:30 the party returned to Philadelphia, after voting their most cordial thanks to Mr. Blood and the International Shipbuilding Corporation for the enjoyable day.

## ENGINEERING COUNCIL SEEKS COMMITTEE HELPERS.

**Assistants and Correspondents Desired to Extend War Service of Council Throughout Country.**

Engineering Council, as was designed, is engaging in numerous activities for the engineering profession of America, many of these activities being directly or indirectly connected with the war. The Council is a body of representatives from member societies conducting most of its work through committees. For effectiveness these committees have usually a small number of members, although committee membership is not limited to the representatives on Engineering Council. Men have been selected for committee membership because of broad knowledge and extended experience in the field assigned to the committee.

As the work of some committees develops, however, there are occasions when helpers are needed who can devote time to details, to special investigations, to getting local information in some community or state, to compiling and analyzing information already accumulated, or to scouting for men needed for some particular service. When need arises for such assistance it is often difficult to think of or to find the right man available at that moment. In order to meet this difficulty, to give a larger number of engineers a share in the activities, to broaden Council's contact and gain greater breadth for its views and statements, as well as to make its work more widely known, Engineering Council is requesting engineers who can help, to write to its office registering their names and addresses, and in a general way stating the extent and nature of service each is willing to render. This is an opportunity for some of the younger members of the profession to take a hand in society activities, but the request is not limited to the men of few years. Of course, not every one registered may be called upon or it may be a long time seemingly before a given volunteer is asked for help. On the other hand, calls may come promptly and frequently and opportunity may be afforded for services of no small value to the profession and the public.

To indicate a few lines of Engineering Council's work, brief statements are given about some of the committees. The Public Affairs Committee reports on matters of public policy and those relating to national, state or local government, other than technical questions. One question of active interest now before this committee, for example, is that of licensing engineers.

The American Engineering Service has the duty of compiling as complete a classified catalog of the engineers of America as it may be practicable to get together. Much information has been assembled but a great deal remains to be collected. During wartime lists collected by this committee and the engineering societies co-operating with it are being used to supply thousands of names in response to calls from Government departments for specialists for combatant and other forces of the Army and Navy and for the war industries. This committee frequently could use volunteers not only in New York but in various parts of the country.

Engineers who are able and willing to take some part in this service for the profession should communicate with Alfred D. Flinn, secretary of Engineering Council, 29 West 39th Street, New York City.

## PLANS MADE BY FLEET CORPORATION FOR NEW STEAM-ELECTRIC PLANT AT PHILADELPHIA.

**Designed for 90,000 Kilowatts Capacity to Meet Possible Power Shortage at Hog Island and Vicinity.**

Announcement is made by Charles Piez, vice-president of the Emergency Fleet Corporation, that plans have been completed for the construction of a steam-electric power plant of the capacity of 90,000 kilowatts, at Philadelphia, to meet a possible shortage of power at Hog Island and other shipbuilding centers in that section of the country. The plans proposed are receiving the consideration of the War Industries Board. The estimated cost of the plant proposed is $11,000,000.

Most of the energy now used at Hog Island and other industries in that vicinity is being supplied by the Philadelphia Electric Company, and an anticipated shortage of power is due to the rapid expansion of many industries. It is to prevent any crippling of shipbuilding and munitions manufacture that it is proposed to erect and equip a Government plant. It is understood that the Philadelphia Electric Company has offered to construct the power-producing facilities necessary to supply the additional load of 90,000 kilowatts if the financial support of the Government is granted. It is given out, in this connection, that Pittsburgh and other manufacturing centers also may find it necessary to provide against possible power shortage by reason of the continual appearance of new industries. In meeting such increasing power demands the united attention of all is turned to ways and means of generating more electric energy.

## MR. HURLEY'S OUTLINE OF OUR MERCHANT MARINE.

**Its Utility and Mission During and After the War Is Frankly Explained.**

Edward N. Hurley, chairman of the United States Shipping Board, in an address presented June 10 at the commencement exercises at Notre Dame University, South Bend, Ind., presented an array of facts concerning the growing merchant marine of the United States which readily will be accepted as an important message to the people of the whole country. After reviewing the causes which brought us into the war, and defining the motives which actuate us as a nation in its prosecution, Mr. Hurley gave a graphic resume of what the Government has accomplished in the last two years in the construction of a merchant marine.

We have now, according to his figures, a total of 1400 ships of a deadweight tonnage of 7,000,000 tons under control of the United States Shipping Board. This represents a net increase of 4,500,000 tons of shipping since the United States entered the war, and includes ships built, commandeered and chartered. He gave an outline of the tremendous facilities for shipbuilding now possessed, and gave figures showing the remarkable speed at which construction is now going on. With the completion of 819 shipbuilding ways, now under construction, this country will have twice as many such facilities as all other shipyards of the world combined. The Board's building program contemplates the construction of 1856 passenger, cargo, refrigerator and tank vessels, ranging from 5000 to 12,000 tons each; and in addition to this plans provide for 200 wooden barges, 50 concrete barges, 100 concrete oil-carrying barges, 150 tugs of steel, wood and concrete.

This makes 2101 vessels, exclusive of tugs and barges, of an aggregate of 14,715,000 tons. This construction for 1918, 1919 and 1920 involves an expenditure of $5,000,000,000. This will give us the greatest merchant fleet ever assembled in the world. About 300,000 men are engaged at shipyards, and 250,000 more in allied industries. It is predicted that by 1920 about one million men will be employed on American merchant ships and their equipment.

Finally, the great point of Mr. Hurley's address was that the vast merchant marine, which the United States is producing at a rapid rate, will be required and must be utilized after the war as the instrument for establishing and maintaining international square-dealing and in protecting the weak against the aggressions of the strong. He especially points out that lines of ships carrying the Stars and Stripes should be established between our ports and all South American countries, and to all points in the Orient.

## CONFERENCE HELD TO ADOPT PLANS FOR LAND RECLAMATION BY ELECTRIC PUMPING.

Isham Randolph, of Chicago, and W. P. Bushnell, Quincy, representing the Hunt Drainage District, and Edmund T. Perkins, Chicago, representing the Lima Lake Drainage District, entered into a conference at Quincy, Ill., with S. H. McCory, chief of the Bureau of Drainage and Investigation, regarding plans for the reclamation of those two districts.

The plans proposed contemplate establishing electric pumping plants. The bodies of land in the two districts, amounting to 30,000 acres, are situated between Quincy and Warsaw, Ill. Levees have been built, but there is no interior drainage. This move is in line with other similar projects for the reclamation of overflow lands involving the use of electric power.

## EMPIRE STATE ASSOCIATION HOLDS MEETING AT SYRACUSE.

**Electrical Section Discussed Production and Distribution Problems.**

The Empire State Gas and Electric Association, New York City, under the auspices of the Electric Section of that association, comprising the production and distribution departments, held a meeting on Friday, June 21, at Onondaga Hotel, Syracuse, at which the following topics were discussed:

War-time economies; the labor situation with reference to the substitution of women for men, and the use later of partially disabled soldiers in accordance with the request by the Government.

Fuel conservation, and the proposed rating of plants by the Fuel Administrator; the effect of daylight saving on load curve and coal consumption.

Subject of 11,000-volt distribution, as regards methods of connecting transformers, and of protection from lightning in connection with serving farmers along the line.

Rear-lot distribution in residence districts; outdoor substation design and construction.

Electric furnace operating, with special reference to effect of furnaces on system regulation.

Arrangements with consumers for installation and maintenance of synchronous motors on their premises for improving power-factor on distribution system.

## ILLINOIS UNIVERSITY OFFERS COURSE IN RADIO COMMUNICATION.

On account of the urgent need of the Government for men qualified to render special technical service in the Signal Corps, the Department of Electrical Engineering of the University of Illinois is offering a course in radio communication during the summer session of 1918. This course is for men who wish to prepare themselves for research and development work or for field service in the Signal Corps of the Army. Instruction will begin Monday, June 17, and will continue until August 9. In addition to theoretical work, the course will include practice in sending and receiving telegraphic messages in the International Morse Code. For full particulars regarding this course, application should be made to the Department of Electrical Engineering, University of Illinois, Urbana, Ill.

## FIRE LOSSES FROM ELECTRICAL CAUSES IN 1916.

In the report in our issue of May 18, of the address by Dana Pierce, of Underwriters' Laboratories, before the Electric Club-Jovian League of Chicago on May 9 figures were given of fire losses from various causes. From the statement as printed it might be inferred that the figures given were the totals for a three-year period whereas the report should have stated that while statistics have been collected for a period of three years or more, the figures given were those for the single year of 1916 alone.

It is obvious that these figures applying to a single year rather than a longer period, even more forcibly illustrate the necessity for attention to electricity as a fire hazard.

# Commercial

## *Indiana Utility Participates in War Stamp Drive—Increasing Public Utility Income Without Undue Expenditures*

### EFFECTIVE PARTICIPATION OF MERCHANTS HEAT & LIGHT COMPANY IN WAR STAMP DRIVE.

Ever alive to the obligations of a public service company in civic and patriotic activities, the Merchants Heat & Light Company, of Indianapolis, Ind., has taken a very prominent and effective part in the War Savings Stamp campaign in that city. In addition to liberal contributions of money, the company has devoted practically all of its newspaper space to that cause, as well as its show windows.

The accompanying illustration shows the most recent activities of the company. As will be noted, practically one entire side of the company's office building has been utilized for signs advertising the campaign and providing space for the recording of progress made in the sales of stamps.

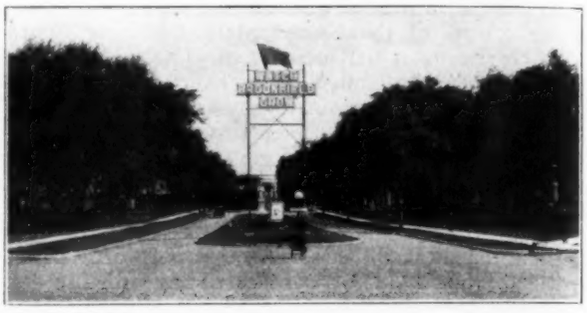
The drive in Indianapolis and Marion County to sell $5,000,000.00 worth of stamps was inaugurated by an address by Theodore Roosevelt to a crowd of 15,000 people on June 11.

The largest cash register in the world was erected by the side of the office building of the Merchants Heat & Light Company, the busiest corner in Indianapolis. The accompanying view shows the cash register and the signs on the Merchants Heat & Light Company's building, popularly known as the "Daylight Corner."

View of Merchants Heat & Light Company's Building During War Stamp Drive.

### SLOGAN SIGN HAS BEEN A FACTOR IN TOWN'S GROWTH.

Not a community club, but electricity, has been the means of arousing the progressive spirit in the little Missouri town of Brookfield. It has been just a year since the slogan "Watch Brookfield Grow" was



Slogan Sign Which Has Fostered Growth of Brookfield, Mo.

adopted and a large electrical sign erected at the end of the broad main street of the community. In that time the citizens of Brookfield have learned to work together in the mutual task of putting it on the map.

The man to take the initiative in the movement was Percy Markham, manager of the local electric light company. Mr. Markham hit upon the brilliant idea of merging electricity and civic development and went about the matter with characteristic promptness.

The location of the sign is at the end of a street only three blocks long and very wide; so wide, in fact, that the automobiles which are parked two abreast in the center still leave a space for traffic on either side. The park is at one end of the street and the station at the other.

The scheme was received with enthusiasm by the people and it needed only the word to set them in motion for a whirlwind drive to carry out the project. The business men got together, hired a local band, engineered the construction of some floats, and before the excitement had time to die, a parade was in progress. The same evening a local talent entertainment was held at the opera house and the proceeds donated to the cause. Before the day was over the entire amount of six hundred dollars had been raised. Mr. Markham made the proposition that if the city would raise the funds for the purchase of the sign his company would guarantee to furnish the current and take care of the maintenance, which about divided the cost between the two.

The sign, which is of porcelain, is set on iron work about 35 feet from the ground, is 24 feet wide with 24-inch letters, and surmounted by an eight-foot flag. The iron work is set in concrete piers which means that the structure is there to stay and that the public-spirited citizens will bid all comers to "Watch Brookfield Grow" for years to come.

## WAYS DEVISED FOR INCREASING PUBLIC UTILITY INCOME WITHOUT UNDUE EXPENDITURES.

**John G. Learned, of Public Service Company, Discusses Subject Before N. E. L. A.**

The subject of "Added Income Without Added Capital" was well elucidated in a paper read at the recent convention of the National Electric Light Association, by John G. Learned, Chicago, assistant to the vice-president of Public Service Company of Northern Illinois. In leading up to this company's plans and methods of increasing its income without additional capital expenditures, Mr. Learned introduced a few facts governing existing conditions, which are as follows: As it is impossible to engage new capital for business expansion except at prohibitive interest rates, all capital expenditure is kept down to the minimum for the period of the war; customers requiring service involving extensions are required to finance such extensions; the increasing cost of production, due to advancing prices of material, increasing wages and higher freight rates, is a matter of vital concern; there is a loss of income by reason of the Daylight Saving law; one vital problem is to secure additional income from energy sold at a high rate per unit without employing additional capital.

In pointing out the avenues for increased revenue, without capital expenditure, he referred to residence and apartment customers as offering excellent possibilities. They welcome labor-saving appliances on account of scarcity of household help.

While electricity for lighting the home is considered a necessity, he referred to the fact that even the most modern type of home is seldom adequately wired to accommodate such appliances as the washer, ironer, vacuum cleaner, toaster and iron, and as a result the housewife is deprived of their comfort and effectiveness and the company of legitimate income. On the subject of house wiring it is stated that the tendency of the average wiring contractor is to cut down the number of outlets in order to obtain wiring business. To overcome this practice the receptacle manufacturers are conducting local educational campaigns, urging wiring contractors to push the installation of receptacles. As a result the contractor will benefit from the immediate business and will find it easier to sell appliances in a home that is thoroughly equipped than one that is not.

Through the efforts of this company manufacturers of appliances, receptacles, conduits and allied products are urging additional outlets; and the speaker referred to the more liberal installation of receptacles as the keynote for future merchandise sales. It is much easier to convince the housewife of the desirability of having a line of household appliances if receptacles are previously installed for their convenient use.

One of the ways of increasing the company's income, he states, is by selling more appliances to present customers and encouraging their greater use by those who have them. The appliance load is off-peak and has a high diversity, so its effect on the line and station capacity is negligible.

Mr. Learned then gave an outline of the company's plan of enlisting the interest of all employes in selling appliances by offering a commission of 5 per cent on all sales during spare time, or after business hours. Many employes have taken advantage of this, and in making sales some of them have the co-operation of their wives.

The greater the number of contractors and dealers that have appliances on sale, the greater will be the number sold, and the result is increased income to the company. Therefore, it is opportune to encourage wiring contractors and dealers, either directly or through the manufacturers of appliances, to engage in this business.

## ELECTRICS MEETING GREAT DEMANDS IN MANY COUNTRIES.

Thousands of electric trucks are being used successfully. Many of the largest transportation fleets are composed chiefly of electric vehicles and these are constantly being added to, which is the best proof of their value. Such selections are made only after careful investigation of all the elements involved. Transportation engineering is here evidenced in its most advanced application.

In England, after years of war, the rate of electric vehicle increase is in excess of 600 per cent, with prospects of greater gains. An extensive electric vehicle development is planned in France, where current generated by water power is available, thus lessening demands for gasoline, the importation of which imposes demands on ship tonnage—a vital issue these days. Besides this, electrics in France may be operated by men and women other than those needed in direct war work.

From what we can learn of conditions in Germany, the electric vehicle, a large factor prior to the war, has now assumed there a more commanding position in transportation, as in other countries.

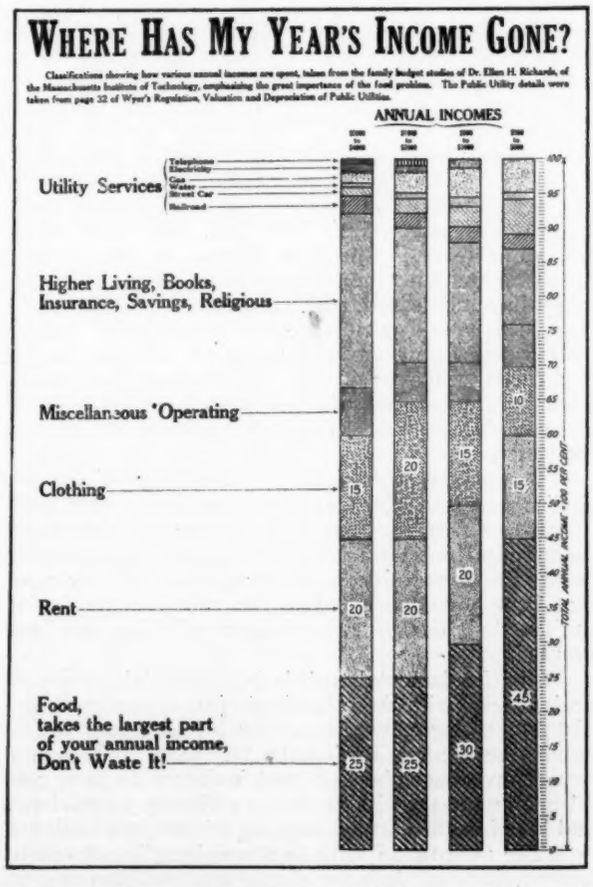



**Chart Distributed at Convention of National Electric Light Association Showing the Insignificant Cost of Utility Services as Compared with Other Living Costs.**

## CENTRAL-STATION MANAGERS MUST BE OPTIMISTIC.

**Confidence in Earning Power of Business Must Be Reflected to Public and Bankers, Says Samuel Insull.**

The convention of the National Electric Light Association held last week at Atlantic City brought forth no more important lesson than that emphasized by Samuel Insull, president of the Commonwealth Edison Company, Chicago, and chairman of the Illinois Council of National Defense, in his inspiring address at the dinner on Thursday evening. Mr. Insull held that the fundamental problem before the utilities today is a financial one and its solution rests with the investment bankers and investing public. If the utility managers themselves have no confidence in the earning capacity of their business, certainly the necessary money will not be forthcoming. Mr. Insull said in part:

"I have been sitting listening to some of the speeches delivered today at our convention meetings and I must say that a note of despair has run through some of the speeches delivered, a note which I question to be justified by the conditions existing so far as the effect of the war on our business is concerned.

"While every article making up the cost of our product is either directly or indirectly governed as to price by federal action, our selling price of our product has remained more or less stationary, but I do not agree with some of the statements made today to the effect that we are getting little or no relief so far as selling price is concerned. In some states the wording of the laws creating commissions is somewhat ambiguous so far as increasing prices is concerned, but as a rule the laws creating commissions in the various states leave with the commissioners the authority to increase or decrease price as necessity may arise.

"In some states we are unfortunate enough to be still operating under conditions where our maximum price is governed absolutely by municipal ordinance, but in a few cases it has been found possible to create local sentiment of a sufficient and enlightened character to result in relief from your maximum prices and an increase in the selling price of our product proportionate with the increase in our cost. We certainly have no reason, and I am speaking alone in the electric light and power portion of the public service industry because I am addressing an audience that is particularly engaged in the electric light and power business, to complain of the course taken by most of the commissions governing our business in most of the states.

"It has been authoritatively stated that of the 460 applications made for increased rates in the year 1917, upward of 400 decisions were given favorable to an increase in the selling price of the applicant appearing before those commissions, and there are but few cases that have been presented to the commissions during the first half of 1918 where some relief has not been granted.

"Our fundamental trouble is a financial trouble. It deals largely with the refunding of maturing securities and the placing of new securities for necessary capital expenditures made during the last year. We cannot expect investment bankers and investors to have confidence in our securities unless we display a confidence and belief in the earning capacity of our own business.

"The note that I wish to sound here is not one of lament that our balance sheets are not showing up satisfactorily, but it is a note of assurance. With labor increasing in cost largely as a result of federal action in addition to the ordinary laws of supply and demand, with the cost of fuel increasing partly as the result of governmental action and partly as the result of the operation of the laws of supply and demand, with freight rates increasing entirely as the result of governmental action, and with the prices of all commodities used in our business increasing as the result of the increase of cost of labor and the increase in the cost of transportation, it does not seem possible in this day and generation that we can contemplate the possibility of our selling price remaining stationary. And the experience with those of us who have appealed to our friend, Charles Merz, who is consulting engineer for some of our companies on this side, and who to a very large extent got his ideas as to the course which should be pursued in connection with such matters from the experience he had gained from the massing of production and the centralization of distributing systems in the United States.

"To some of us who have been engaged for years in pointing out the true economics of our companies and who have had to reply to the claims of the politicians that we were engaged in building up great power trusts, it was rather a pleasure to have the assistance of the federal Fuel Administrator in urging that the very things that we have been doing on quite a large scale in different parts of the United States should be adopted as a universal rule so far as it is possible, when such a course could be adopted.

"Now, there are other advantages we have gained as the result of the increased cost of our product. We have learned to do away with a lot of unnecessary expenditures, both of a capital character and of an operating character. Our business has grown with such tremendous rapidity during the last quarter of a century that those who thought we were operating the most economically have fallen into practices not at all required under the orders of various regulating bodies, but adopted largely by us to foster the getting of additional business, and we have indulged in those extravagances which, at a time like the present, when operating expenses must be watched to the limit, we have been able to dispense with. And we have been able to compensate to some extent for the losses that have been brought upon us as the result of the increased cost of labor and material.

"But we are not here today to look into our balance sheets so much as we are to look into matters in which we can be of real help to the Government in the operation of the war.

"Now, it does seem to me that such a body of men owes a particular responsibility to the Government in a time like the present. It should not need any persuasion, judging from the experience we had last winter, to prevail on an electric light and power man to store fuel. It should not need any persuasion to get him to see that his employes store fuel. It should not need any persuasion for him to see to it that the community in which he lives, either as a community or as individual manufacturers or householders, store fuel.

"But there are a great many things in addition that we can do that will be of great assistance to the Government and will greatly assist in the movement of fuel and the correcting of the trouble that the Union as a whole suffers from in the shortage of production.

"There is no time and there is no capacity to manufacture new equipment. It is a case of bringing that equipment from unnecessary uses and employing it in the most essential uses, namely, to provide the fuel for the purpose of moving the wheels of industry and of commerce."

# Operating

## *Phantom Test Load—Boiler Room Trouble—Fir Poles—Protecting Steel Towers—Power-Plant Questionnaire*

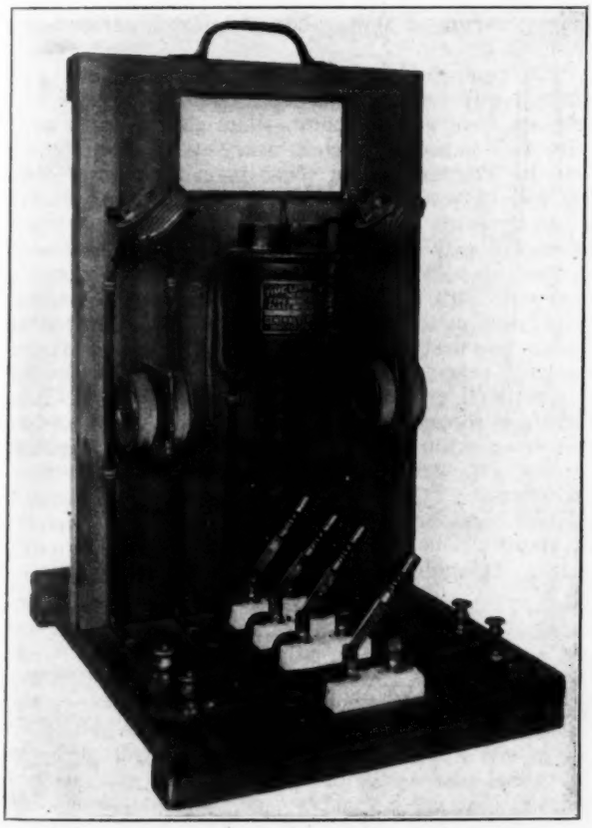
### PHANTOM CIRCUIT FOR CURRENT TRANSFORMERS.

**Method Employed for Obtaining Current Transformer Performance Under Actual Conditions.**

By M. Graham.

It has long been appreciated that the characteristics of the current transformer, that is, current ratio and phase angle, vary under different conditions. Of the factors playing the more prominent part in affecting current transformer characteristics are the constants of the load, namely, resistance and inductance, iron loss of the current transformer, and wave form.

The wave form is usually considered a constant for any system. The iron loss also is fairly constant for any transformer, and the transformer can be calibrated for use with a wattmeter after determining the loss and its effect upon the angle of displacement at various power-factors. The chief variable in ordinary commercial operating practice, which includes metering installations in stations and customers' premises, and so on, is the load in the secondary of the current transformer. The load on the secondary may consist of the coils of overload and differential relays, integrating or indicating wattmeter, ammeter and perhaps a recording wattmeter also, each having resistance and inductance. In addition the distance between current transformer and the instruments and size of wire used, factors also embracing resistance and inductance, have also to be considered as comprising the load.



Portable Phantom Load for Testing Current Transformers.

The accompanying illustration shows a method of obtaining a phantom circuit, used during tests to determine the properties of a current transformer. This phantom circuit, illustrated in Fig. 1, comprises the coils of one wattmeter, one current ammeter, or two, as shown, or definite length of line when needed. These coils are mounted upon a wood rack which is placed on the test bench before the man making the test. Three knife switches enable any of the coils to be cut out of circuit as desired, depending upon the service for which the current transformer is to be used. The coils have the constants of standard types of instruments. In this way accurate data as to the performance of a transformer with any of the various forms of load in the secondary may be checked up, and with little trouble or loss of time. But the one great advantage of this is not so much the saving of labor and time, but the fact that a transformer may be tested without the actual instruments being on hand; in fact, a transformer may be tested and installed before the instruments arrive, if convenient.

### STEAM-FLOW METERS SOLVE FIREBRICK TROUBLES.

**Interesting Example of Lack of Instruments and Supervision.**

By Lionel Linnell.

The technical press has had considerable to say of late about the $CO_2$ recorder and steam-flow meters as means of improving boiler-room economy. The writer recently encountered a case where lack of a steam-flow meter resulted in serious financial loss and crippled service.

The plant contained eight chain-grate stokers, four stokers being driven by one engine, and two Taylor underfeed stokers, each stoker having its own engine and blower, the control of each co-ordinated so that rate of fuel and air fed to the fire were correct and sufficient to maintain the steam pressures of their respective boilers. The chain-grate stokers, using natural draft, were hand controlled, that is to say, both air and rate of stoker grate travel had to be changed as the firemen found desirable or necessary. The two underfeeds were new additions to the plant.

Not long after the underfeeds were placed in operation complaints were made that brickwork would not stand up. Investigation showed that the setting of one furnace has melted down once, that of the other twice, and in a very short time. The reasons advanced were

that the furnace and setting were not adapted to the underfeed stokers.

On looking over the situation it was found that the only instruments in the plant consisted of the customary steam pressure gauge on each boiler, a draft gauge under each fuel bed, and a Venturi meter for measuring the condensate, or water returned to the boilers, less leakage. The cause that immediately suggested itself was, of course, that the underfeed stokers, with their automatic control of coal and air, were doing more work than their share, because they would tend to grab load automatically, whereas the chain grates would have to be manipulated by the firemen. There was no way of telling whether each boiler in the plant was doing its pro rata share, nor in fact how much work any of the boilers was doing. It was a case, obviously, where everyone in the plant was working in the dark. A steam-flow meter naturally suggested itself as being one of the first things needed to show what was going on.

The installation of steam-flow meters between the underfeeds and the chain grates showed that when the heavy load came on, as it always did rapidly, the underfeeds with their forced draft and close automatic control answered immediately to the demands for more steam; they grabbed the load and tended to keep it. The steam-flow meter showed that, based on pro rata output and boiler rating, the Taylors were the two that picked up every sudden increase of load because they answered to steam pressure variation almost instantaneously, whereas the hand-controlled chain grates were dependent upon the attention of the firemen. Their loads were always greater than the proportional share; moreover, they often worked 300 per cent of rating for varying periods but always until the hand-controlled chain grates were speeded up.

The steam-flow meters showed conclusively that the reason the brickwork would not stand up under the underfeed was not because the brick was defective or the furnace chamber or boiler setting unfitted for the work, but because these boilers were being overworked excessively and for long times at a stretch. When the cause was found it became a simple matter to remedy it, and, as was to be expected, no more trouble with the brickwork has developed.

It is just as impossible to keep boilers operating in parallel and share the load proportional to their ratings without means of telling the attendants what is going on as it is to operate generators in parallel without switchboard instruments. Moreover, this incident shows forcibly the importance of accurately controlling stoker speed and air supply at all times.

## FIR AS A SUBSTITUTE FOR CEDAR POLES.

### Comparison Shows Superiority of Cedar.

At the Pacific Coast Convention of the N. E. L. A. recently held, L. M. Klauber, San Diego Consolidated Gas & Electric Company, gave out some interesting information on the use of fir as a substitute for cedar. Transportation, long distance from supplies to markets, have caused many companies to turn their attention to the use of fir poles instead of poles of Western red cedar, because of the large amount of the former available and their closer proximity to point of usage. Moreover, as fir is shipped in large quantities for commercial use, it is usually possible to obtain supplies in short time. It is the opinion of many that eventually a substitute for cedar poles will have to be found, hence fir, because so plentiful, deserves careful consideration.

In considering any timber for use as supply line poles, the characteristics requiring first consideration are availability, cost, strength and durability. Durability is the most important characteristics of fir, in comparison with cedar, because it is the former that is so conspicuously lacking in fir.

One of the best posted men on poles in the business makes this statement: "The best substitute that can be had on this coast is Douglas fir, and we believe that while in their green state they would be subject to early rot at the ground line, still, after treating with creosote above the ground line, a Douglas fir pole will give very good satisfaction. We do not claim that it will last as long as cedar, but we are under the impression that if properly prepared and treated, its life would be 90 per cent as great as that of cedar." While installations of Douglas fir on a large scale on the Pacific Coast do not yet permit estimates of probable life, it is the universal belief of pole users that to secure a reasonable life an open tank treatment is essential, and that the brush treatment of fir, so often used on cedar with good effect, is practically worthless for Douglas fir. Tank treatments, with open tank, costs from 20 to 40 per cent of the first cost of the untreated pole. Douglas fir is difficult to treat and obtain penetration. The poles should be thoroughly dry; the quantity of pitch and the case hardening on outside of pole during drying all affect depth of penetration, which is always less than with cedar.

Other points which may be mentioned in connection with the use of Douglas fir poles are: Taper, weight, hardness, appearance, checking and tendency to spiral.

The taper in Douglas fir poles is less than in cedar, consequently modifications are required in the specifications covering this point. The natural taper of a cedar pole is about 1 inch in every 10 running feet, so that the average 45-foot cedar pole having an 8-inch top will have a 12-inch butt. ("Butt" measures are 6 feet from the butt.) But in a Douglas fir pole the taper will only be about 1 inch in 15 feet, so that a 45-foot fir pole with an 8-inch top will have only a 10½-inch butt. As it is undesirable to reduce considerably size at the ground line, particularly in dealing with a material more subject to decay than cedar, it becomes necessary to modify the specifications for tops as well as for circumference at the butt. It is therefore recommended that the Class A Douglas fir pole have a top not less than 31½ inches in circumference (10 inches in diameter), Class B, 28 inches, and Class C, 25 inches. We then have the following table of minimum dimensions, replacing in the Douglas fir specifications the standard table for Western red cedar. (Handbook of Overhead Line Construction, N. E. L. A., 1914, page 129):

MINIMUM DIMENSIONS OF POLES IN INCHES.

| Length of pole in feet. | Classes A (Minimum top circumference 31½ in.) Circumference 6 ft. from butt. | B (Minimum top circumference 28 in.) Circumference 6 ft. from butt. | C (Minimum top circumference 25 in.) Circumference 6 ft. from butt. |
|---|---|---|---|
| 30 | 37 | 33 | 30 |
| 35 | 38 | 34 | 31 |
| 40 | 39 | 35 | 32 |
| 45 | 40 | 36 | 33 |
| 50 | 41 | 37 | 34 |
| 55 | 42 | 38 | 35 |
| 60 | 43 | 40 | 37 |
| 65 | 44 | 41 | 38 |
| 70 | 45 | 42 | 39 |
| 75 | 46 | 43 | 40 |
| 80 | 47 | 44 | 41 |

Air seasoned Douglas fir is said to weigh 34 pounds per cubic foot, air seasoned cedar 33 pounds. The

oven dry weights of the two woods are 29 pounds and 25 pounds, respectively. It is evident that Douglas fir poles of similar dimensions will be heavier than cedar, but long poles of similar class, being smaller at the butt, will be lighter than cedar when dried to the same condition.

Douglas fir poles are harder than cedar and more difficult to climb, especially after they have dried and "case hardened." This fact is universally noted by linemen. If these poles come into general use, pole steps may again come into favor for certain classes of service.

As Douglas fir poles run straighter and slimmer than cedar, they make even better appearing poles. When trimmed and shaved they are generally dark red in color, whereas cedar is white, and they are consequently more conspicuous until thoroughly weathered. Although prohibited in the specifications, it is believed that poles used in city work, whether of cedar or fir, should be shaved.

Under similar conditions, Douglas fir seems to check less than cedar and the cracks do not run so deep. This difference, however, is not marked and varies greatly in individual cases. Douglas fir poles, especially when set slightly green, have a decided and unpleasant tendency to spiral. Almost every pole has more or less of a twist, but some appear to untwist much more than others while drying and weathering. As the twist is, however, less than a complete turn in 20 feet, no change need be made in the cedar specification, this being the present limit. (Handbook on Overhead Line Construction, N. E. L. A., 1914, page 131.)

CONCLUSIONS.

The standard specifications for the purchase of Western red cedar poles can be used in purchasing Douglas fir, except as to dimensions. The new table of dimensions given above is recommended.

It is not believed that Douglas fir poles will displace cedar as long as the latter are obtainable at a reasonable price. The inferiority of Douglas fir to cedar poles was thus summed up by a lineman: "They rot faster, you can't drive a spur into a dry one with an axe, you can't tell which end is the top, and they twist a line out of shape as they dry." Nevertheless, these difficulties can be overcome. Douglas fir is the best substitute for cedar to be procured on the coast, and the lumbermen predict that the cedar shortage will soon render their use general.

## A PROTECTIVE COVERING FOR STEEL TOWERS.

Since the coal situation became somewhat relieved and in answer to the Fuel Administrator's plea to store coal now, the Consumers Power Company, Jackson, Mich., has been doing all in its power to relieve the coal situation of the coming winter by storing coal now. It has also made special effort to relieve the car shortage by unloading cars without loss of time. This company is employing every bit of space for the receptance of coal. Their yard at the station has been converted into a coal storage yard. A motor-operated derrick and grab bucket has been installed in the center of the yard and is used continually for distributing coal around the yard so as to permit storage of a maximum amount of coal. So far no demurrage has been paid for cars held, coal is unloaded and moved so rapidly into storage.

In the station yard, now used for coal storage, are located the steel towers and wooden poles carrying the incoming and outgoing 40,000-volt transmission lines that enter and leave the station through the roof. The centrally located derrick has been installed under the conductors carried by these transmission structures, and coal has been dumped around both poles and steel towers until at present the base of the steel poles are covered in some cases as much as 10 feet and more.

Coal is corrosive, especially in the presence of moisture and heat such as occurs after rains, from drainage of moisture through the coal pile and internal heating. To safeguard the steel structures against corrosion, the legs of the structural steel towers have been carefully painted with a triple coating of asphaltum paint up to a height of greater than the top of the coal pile. This paint is depended upon to prevent chemical action by the coal and moisture upon the steel. The paint is non-corrosive, is impervious to moisture and forms a thick acid-resisting coating. After applying the last coat of paint, tar paper or its equivalent has been wrapped around the steel, and this has, in turn, been protected by pieces of wood fastened together around the legs to prevent mechanical injury of tar paper and paint. In this way erosion and damage of the protecting coatings and exposure of the steel work by mechanical contact with falling coal, and even movement of the towers under the influence of wind against the coal in proximity is avoided.

So far the form of protection employed has proved quite satisfactory in that while the foundations are surrounded by coal, inspection shows no sign of disintegration of the asphaltum coating nor damage to the paper or wood guards.

## POWER-PLANT QUESTIONNAIRE NOW READY.

A power-plant catechism or questionnaire, compiled under the direction of M. R. Bump, chief engineer of Henry L. Doherty & Company's New York office, is being sent to the general managers of all power plants in the Doherty organization to assist chief engineers, general superintendents, plant inspectors and others in analyzing plant conditions. It is hoped that those in charge of the plants will find it advantageous to conduct an examination in their respective plants along the general lines indicated in this questionnaire and to report the finding of their analysis.

Based on the assumption that "forewarned is forearmed," this compilation is made to enable all plants to continue to be successful in keeping their maintenance work and operating morale up to a point consistent with plant safety, and to enable managers to keep in close touch with the trend of plant conditions.

To supplement and to facilitate the work of this report, a traveling inspector will cover periodically the various power plants so long as the results continue to justify the necessary time and expense. Several plants have already been examined in this manner with very satisfactory results.

---

There are good reasons for believing that unwashed coal is more susceptible to spontaneous combustion than washed coal. Duff left in coal favors combustion. Washing removes the duff, and therefore reduces the chance of spontaneous combustion from this cause. Coal that is washed is graded, making for more uniform sizes, a fact that reduces the likelihood of the fine sizes and dust causing trouble. It might also be pointed out that washing also eliminates the stone dust in the coal, which is a heat absorbent, and thus washing might be objectionable to this extent.

# Contracting-Construction

## Croft Again Discusses Conduit Benders and Bending Racks —Expansion Sleeve and Stud Kinks—Among Contractors

### BENDING RACKS AND ROLL BENDERS FOR LARGE CONDUIT AND PIPE.

**Bending Outfits of Several Types Using Block and Tackle or Chain Blocks—The Bull-Ring Bender.**

BY TERRELL CROFT.

[*This is the first of a new series of articles describing benders for the larger conduit and pipe sizes. They form a conclusion to the two other series of articles by the same author which appeared in the* ELECTRICAL REVIEW *as follows: "Methods of Bending Conduit," seven articles in issues of January 12 to February 23, 1918; "Some Comments on Conduit Benders," four articles in issues of April 27 to May 18, 1918. These earlier articles dealt with small and medium-size conduits.*]

*A Rack for Bending with Block and Tackle* (Fig. 1) may be useful where relatively-larger-diameter conduit is to be bent and where difficulties are

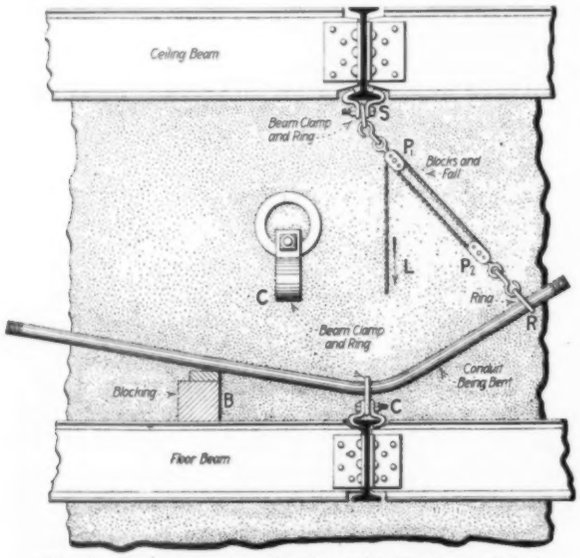



Fig. 1.—Rig for Bending Conduit with Blocks and Fall.

experienced in obtaining sufficient force to form the tube by direct pressure manually implied. With this scheme, the force exerted by the workman who pulls on the line $L$ is multiplied by the pulley blocks $P_1$ *and* $P_2$. Where necessary, several men can pull on the fall and thereby develop a tremendous bending force. As suggested in the illustration, a clamp $C$ to which a large iron ring is attached, is fastened to some member of the floor of the building. A smaller clamp $S$ is attached to the ceiling above the first one. The hook of one of the blocks $P_2$ engages with a large ring $R$, which is placed over one end of the conduit. The other block $P_1$ hooks in the ring at the ceiling clamp. By changing the location of the ring on the conduit and the position and height of the wooden blocking $B$, the pipe can be drawn into the shape required.

Although the illustration shows the method as applied in a building of steel construction, beam clamps can be designed whereby the scheme can be used in a structure of any type. The beam clamps shown in Fig. 1 are forged from ⅝ by 1½-inch strap iron. The rings are welded from ¾-inch iron rods. The bolts

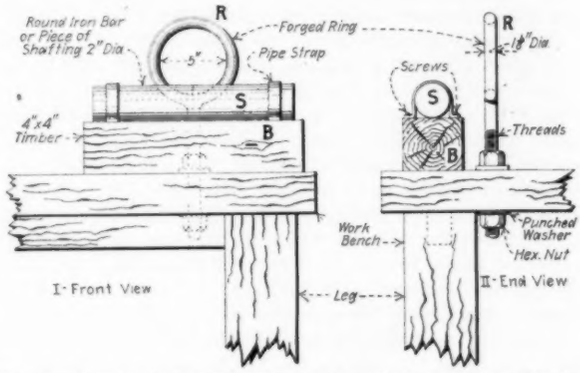



Fig. 2.—Details of Construction of the Shaft-and-Ring Bender.

are ¾-inch size. It may be necessary in some instances to clamp a U-bolt or a couple of pieces of strap iron, each end of each of which has two holes through it, around the conduit just above the ring $R$ to prevent the ring from slipping up or slipping off the pipe.

*A Shaft-and-Ring Conduit Bender,* sometimes called a bull-ring bender, is detailed in Fig. 2, while the method of its use is shown in Fig. 3. To assemble this bender a wooden block $B$, of 4 by 4-inch stock, is provided. On it is held, with a couple of pipe straps, a piece of shafting or round iron $S$, about 12 inches long and 2 inches in diameter. The other member is a large eye-bolt or ring $R$, which should have an eye large enough to admit the largest conduits which are to be bent. The shank of the ring, which should be long enough to extend down through the bench block,

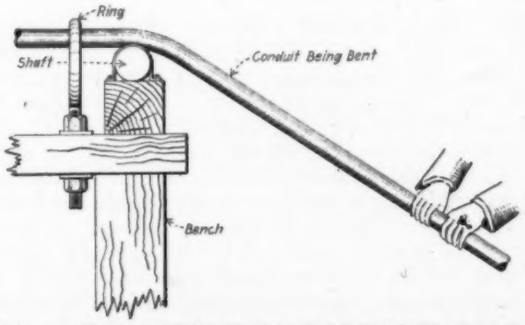



Fig. 3.—Method of Using the Shaft-and-Ring Bender.

is threaded for almost its entire length to permit of vertical adjustment. The shank of the ring shown in Fig. 2 has a length of 14 inches. The ring is fastened to the work bench by boring, through the top of the

bench, a hole of sufficient diameter to admit the shank and by then using nuts and washers as indicated. The height of the ring above the bench top can be adjusted by manipulating the nuts. The washers should be large enough so that there will be no possibility of the corners of the nuts digging into the bench when they are turned.

While the iron cylinder *S* may be fastened to the top of the bench, if a considerable amount of bending of the same size conduit to the same radius has to be done, greater flexibility is obtainable when this block and the iron cylinder which it carries is not fastened to the top of the bench.

In using the rack, one end of the conduit is inserted through the wrought-iron ring and the block is shifted until the iron cylinder rests under the location where

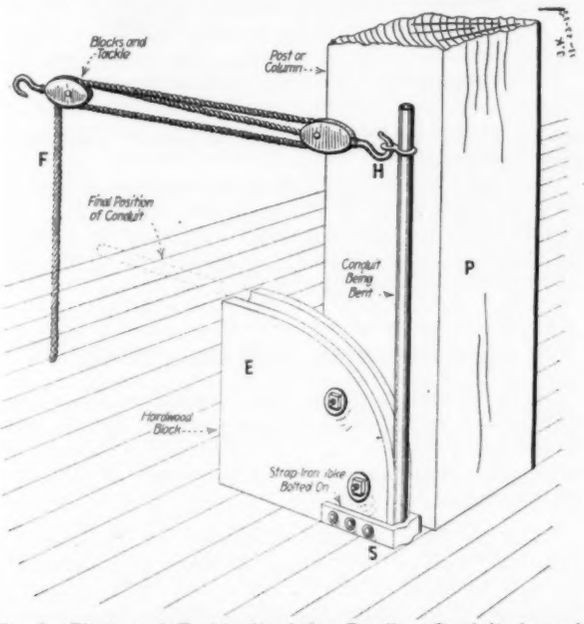



Fig. 4.—Block and Tackle Used for Bending Conduit Around Hardwood Form.

the bend is desired. Then the curve is formed by bearing down (see Fig. 3) on the free end, which will fashion it to the curvature required.

Where a cylindrical piece of iron is not available for block *S*, heavy cast-iron pipe or, in a pinch, a piece of wrought-iron pipe filled with sand or dirt and with a pipe cap screwed on each end, may be used instead.

*A Block and Tackle for Pulling a Conduit into Contour Around a Form* is sometimes applied in the manner diagrammed in Fig. 4. The form *E* has its edge, which is cut to a radius equal to that of the bend

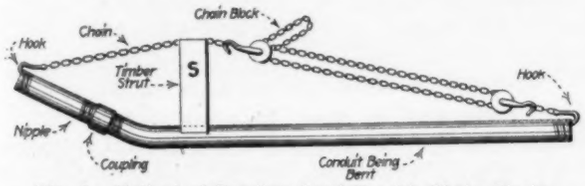



Fig. 5.—Method of Bending Conduit with Chain Blocks.

desired in the conduit, hollowed out so that it conforms to the outside circumference of the pipe. If the edge of the form is not thus hollowed out there is a possibility of the tube being flattened on one side or kinked during the bending process. The form is rigidly bolted to a post or column *P*. A yoke or strap *S* is arranged at the lower end of the bending form, in which one end of the pipe to be bent is held. In bending the conduit, it is inserted within the yoke *S* in a vertical position. Then force is applied to the fall *F* of the block and tackle and thereby the tube is drawn into the curvature determined by that of the form *E*. It may be necessary to clamp a U-bolt or similar con-

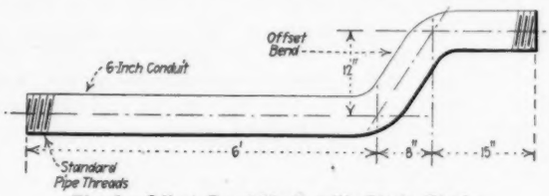



Fig. 6.—Offset Bend Made with Chain Blocks.

trivance on the conduit just above the hook *H* of the pulley block to prevent the hook from slipping from the end of the pipe as it is being pulled over.

*Method of Forming Short-Radius Bends in Conduit with a Chain Block* is diagrammed in Fig. 5. Fig. 6 indicates the dimensions of an offset bend which was made in one instance by this process. In making these short-radius bends in large-diameter conduits it is usually necessary to heat the tube to a dull cherry red along the outside or convex side of the curve. The inner side of the bend may remain at a dull black heat. Hence, where such a bend is to be made the pipe should be heated in a forge and be permitted to remain in the forge while the curves are being formed. If a threaded end is near the point where the bend is to be made, a nipple and coupling should be screwed on to this end to protect the thread and to lengthen the conduit to insure effective working.

The strut *S* (Fig. 5) is merely a block of wood, as detailed in Fig. 7. The outside diameter of a 6-inch pipe is about 6⅝ inches. Therefore, where a tube of this diameter is to be bent, the struts should be of 8 by 8-inch stock.

In making the bend, the tackle and strut are arranged on the tube as shown in Fig. 5. The tube is

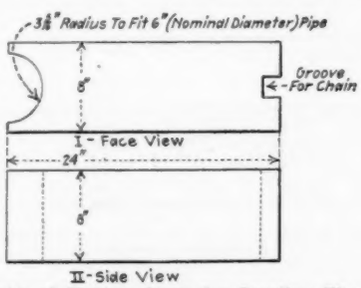



Fig. 7.—Details of Timber Strut for Bending Pipe with Chain Blocks.

then laced in the forge fire, with the face which is to be the convex side of the curve down toward the fire, the strut standing vertically upward. Then this side of the tube is heated, as above described, and the operators pull on the tackle chain, which will bend the conduit a certain amount. It usually is impossible to obtain the required bend at one setting in the forge and pull of the tackle chain. So after the bend has been partially completed, the conduit is shifted in the fire and permitted to become hot at a new location. Then the operators again tighten on the chain block. This procedure is continued until the bend required has been formed. H. K. Scholefield reports in Practical Engineer that two bends similar to those shown in Fig. 6 were made in four hours.

*(To be continued.)*

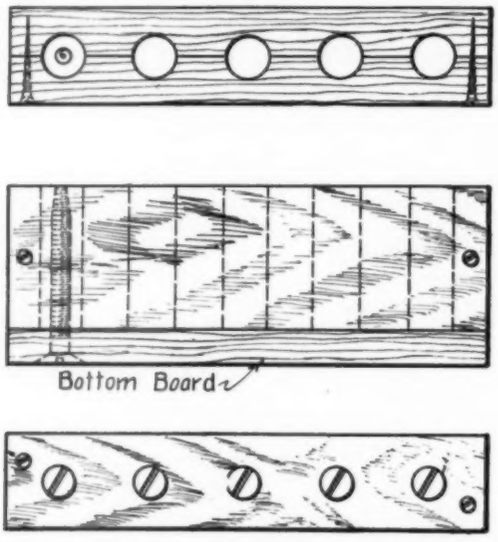
## WOOD MOLD FOR MAKING EMERGENCY EXPANSION SLEEVES.

By A. Gemmell.

On a rush construction job we recently had to put up a lot of 1½-inch conduit and, as most of it was to go along a brick wall, it meant that quite a number of lead expansion sleeves had to be used. For some unknown reason only a few sleeves had been sent out with the material and as the job was in another town far from the shop, we had to make up some more sleeves in some way or other. It was done by first making a wooden mold, as shown in the sketches herewith, which are practically self-explanatory. The mold consisted of three boards with holes for the sleeves bored as shown; wood screws were put through the bottom board to act as cores in the center of the sleeves.

After the lead was poured in and cooled, the core screws were removed first, then the screws holding the bottom board, and finally the screws holding the two sides together. This gave us sleeves good enough for the emergency and without losing much time.

In making a mold of this kind it is well to bore the holes for the sleeves with the sides of the mold held in a vise, as this will result in the core screws being centered better. A mold of this kind will last quite a while, especially if the metal is not too hot when poured in, as this tends to char seriously or even set the wood on fire.



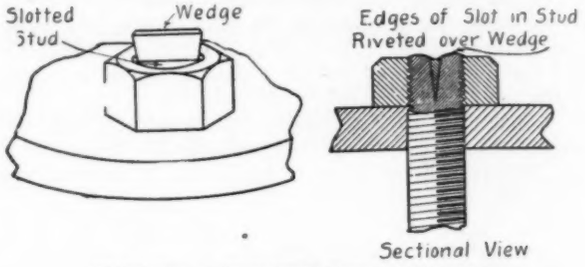

Top, Side and Bottom Views of Mold for Making Emergency Expansion Sleeves.

## MAKING QUICK REPAIRS TO A STRIPPED STUD.

By Charles H. Willey.

Sometimes when one sets up the nuts on the studs of a leaky cylinder-head gasket, valve-chest cover, etc., of the engine, pump or air compressor, there may be found a stud stripped of its threads. To renew the stud means shutting down and taking off the head to get out the stud. A way to avoid this shutdown is shown herewith.

The sketches herewith really tell the whole story, but a couple of lines may serve to make the method clearer. After removing the nut a slot is cut into the stud by means of a hacksaw with two blades placed side by side in the frame. A small iron wedge is made and driven into the stud after the nut has been loosely replaced. The protruding part of the wedge is then sawed off and the edges of the slot riveted over the wedge to hold it in place. The nut is then tightened up.




Tightening a Stud With Stripped Threads.

We have made quick repairs by the method shown, on a stripped stud of the high-pressure head of our 350-kilowatt engine, and after inserting the wedge, riveting over, and then setting up a little on the nut, the job was entirely satisfactory.

## AMONG THE CONTRACTORS.

J. J. Agutter & Company, electrical engineers and contractors, 622 Fourth avenue, Seattle, Wash., have the contract for the complete electrical wiring in the Maxmilian Apartments, a new four-story building being erected in that city.

The Sanborn Electric Company, of Indianapolis, Ind., has received the contract for the electrical work in the new building of the Indiana University School of Medicine. The contract price was $6,760. It is planned to start building operations at once. The present structures are inadequate and a fire last December placed them in further unsatisfactory condition. The new building will be three stories high and of brick construction. The total estimated cost will be about $250,000.

The Live Wire Supply Company, Macomb, Ill., has decided to specialize in retail merchandising, and in order to secure the necessary floor space for its store, offices, storage and shops, has moved its headquarters to 15 East Side Square, where an entire building of two stories and basement will be occupied. The company also has stores at Beardstown, Bushnell, Rushville and Havana, Ill., and will continue to do a contracting business also. This firm was until recently known as the Home Electric Construction Company. W. I. Savidge is president.

J. Livingston & Sons, Inc., 405 South Clinton Street, Syracuse, N. Y., operating a general electrical contracting establishment, has recently completed a number of large contracts, including the installation of a new electric lighting system and power units in the four-story building of the Church & Dwight Company. This contracting company is rushing to completion the installation of the lighting system and power units in the large new plant of the Syracuse Rendering Company, and in the new buildings at the plant of the New York Air Brake Company at Watertown, N. Y.

# New Appliances

## *Safety Switch—Concrete Mixer—Oil Pump—Dashboard Socket—Prepay Meter—Plug Fuse—New Corner Insulators*

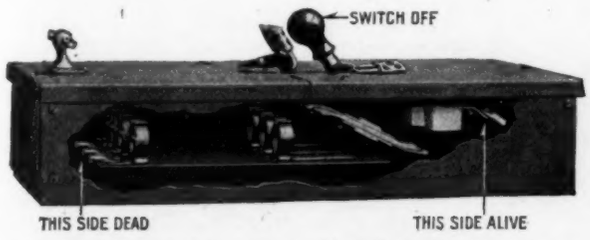
### KRANTZ SAFETY SWITCH.

In many steel mills, factories, mines, and similar industries where most of the workmen have little knowledge of electricity, it is desirable to use switches having no live parts exposed or accessible in the ordinary operation of the switches or when replacing fuses.

This is fully accomplished in the "Krantz Auto-Lock" switch, marketed by the Westinghouse Electric & Manufacturing Company, which is intended for use on main circuits or wherever an ordinary knife switch is applied. The switching parts and fuses are inclosed in a steel box, the cover of which is in two parts, one being screwed on to form a permanent covering for that end of the box containing the switch, and the other part being hinged so as to swing back and permit the renewal of fuses, which are located in this portion of the box. An ingenious latching mechanism makes it impossible to open the cover without first throwing the switch to the "off" position and rendering all fuses and other accessible parts dead. Thus fuses may be replaced at any time with absolute safety. As long as the door of the case is open, the switch contacts can not be closed.

By using a padlock, the switch handle can be locked in the off position, making it impossible for any one to close the switch, except the person holding the key to the padlock. By using another padlock, the fuse cover may be locked shut, so that the fuses cannot be tampered with. Either of these padlocks can be used independently of the other, so that the switch cover can be locked shut with the switch either on or off, or the switch can be locked in the off position with the cover either locked or open.

Contact is made by means of a laminated spring copper brush, double-ended with auxiliary arcing contacts at each end. The outer leaves of the brush are bronze to provide additional spring pressure. In closing, the pressure between the contacts causes the lami-

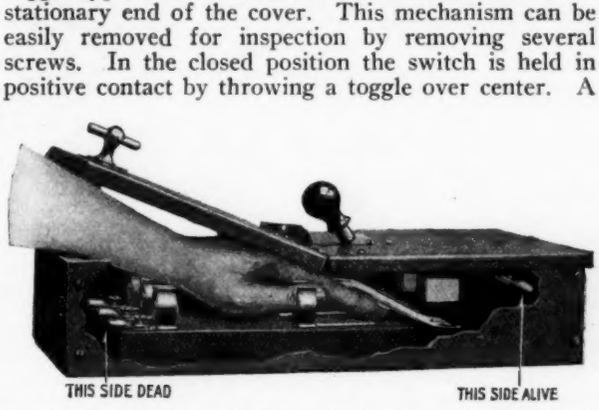



Krantz Auto-Lock Switch, Locked in Open Position, Cover Locked Closed.

nations of the brush to spread apart, giving it a wiping or self-cleaning action. The double-ended brushes provide a double break, dividing the arc between the two ends, each of which is provided with a separate arcing tip.

The stationary contacts are of hard-drawn copper and are mounted on slate bases, one of which in the fused switch carries one of the fuse clips while the other forms the terminal block for the incoming line and is mounted under the stationary portion of the cover.

The operating mechanism is galvanized steel of the toggle type, and is attached to the under side of the stationary end of the cover. This mechanism can be easily removed for inspection by removing several screws. In the closed position the switch is held in positive contact by throwing a toggle over center. A




Showing That It Is Impossible to Touch Live Parts of Krantz Switch.

spring provides a quick break for opening, the mechanism being independent of the operating handle.

These switches are supplied for 250, 500 and 600 volts, for either alternating or direct-current service, and in capacities up to 2000 amperes.

The safety features of this switch have been recognized by the American Museum of Safety, which has awarded it a gold medal and special mention.

### CONCRETE MIXER SUITED FOR MANHOLE AND CONDUIT WORK.

There has long existed a distinct need for a practical, efficient concrete mixer for work on manholes and underground conduits. This class of work becomes very expensive when done by hand and it is also very difficult now to get men to do such heavy work. The larger mixers cannot be used efficiently or economically on construction of this kind. What is needed is a special portable mixer particularly adaptable to small jobs—jobs where speed, portability and a perfect mix are essential.

Such a mixer is being manufactured by the Oshkosh Manufacturing Company, Oshkosh, Wis., maker of the well known line of Oshkosh construction tools. This mixer, as its manufacturers claim, seems to be particularly fitted for manhole and conduit work. It is highly portable, weighing only 1600 pounds, yet is sturdily built to withstand the hard wear it is sure to get in this kind of service. This "Eveready" mixer is exceptionally speedy for a mixer of this type; it turns out a perfect mix in 45 seconds, an accomplishment which the Oshkosh Manufacturing Company claims has never been equaled by a tub-type mixer. The batch capacity of the Eveready, 4 cubic feet, is

fast right for manhole or conduit work. Turning out a perfect mix at the rate of 35 to 50 cubic yards per day, this makes a highly efficient little machine.

The Eveready mixer is very simple in construction, having only one gear, one shaft and two ball bearings. It is of the worm-type drive, the worm gear running in oil and being completely housed, as are all bearings and the shaft. There are two universal joints in the drive shaft. These serve to relieve unusual strains and to take up irregularities of alignment. The mixing drum is of the tub type and turns on a ball-bearing race. It has the same "four motion" mix as the larger and more expensive machines. Another feature of simplicity is the oiling system. The entire mixer is lubricated from one oil hole.

Material is shoveled in to an opening of ample size and the drum is automatically discharged by opening a shutter (without tilting of the drum) and allowing the mixed batch to run out, either into a wheelbarrow or direct into the forms. The whole drum can be discharged in 12 seconds, or only a portion of it may be discharged at a time; this is a feature which is very desirable in a mixer of this kind. This automatic discharge makes the machine exceptionally rapid.

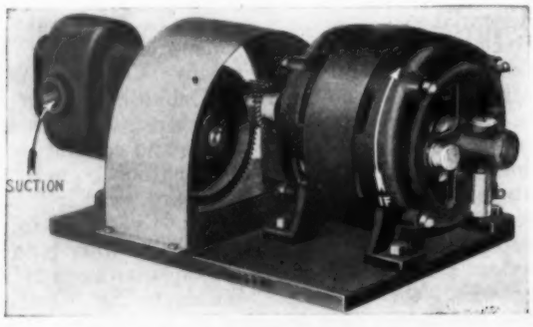
The Eveready outfit is driven by a special two-horsepower, two-cycle, horizontal, water-cooled, gasoline engine with a direct drive. This engine furnishes ample power and is so extremely simple that any ordinary workman can operate it.

Compared to other complete-with-power mixers the Eveready machine sells at a very low figure. The price is considerably below $300, yet the quality is fully as good as that of any of the larger, more expensive Oshkosh machines. The Eveready is backed by reputation of the Oshkosh Manufacturing Company for making quality equipment for contractors. This firm is known as one of the leading firms in this line and is particularly known in the telephone and electrical fields for its high-grade construction tools, such as reels, cant hooks, pike poles, climbers, crowbars, digging and tamping bars, spoons, shovels, digging tools, pole supports, etc.

## MOTOR-DRIVEN PUMP FOR HANDLING OIL.

Wm. W. Nugent & Company, Chicago, Ill., have developed a geared, motor-driven rotary oil pump for oiling systems and for pumping oil from a barrel to an overhead reservoir. Two sizes of the outfit are obtainable having a delivery of 8 quarts per minute and 40 quarts per minute at 500 revolutions per minute of the pump.

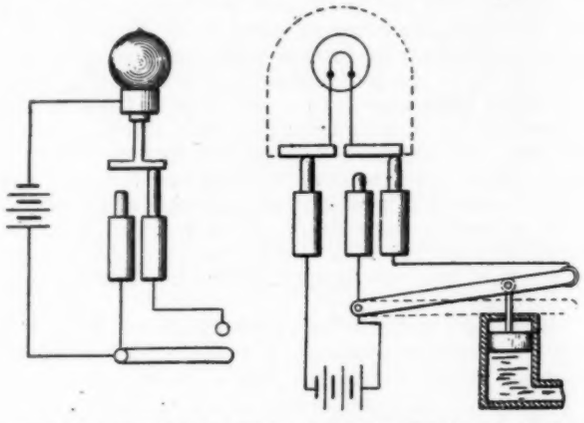
Power is furnished through a noiseless rawhide pinion by the fractional-horsepower motor made by the General Electric Company for the prevailing current. The motor is controlled through a rheostat and switch box mounted in a convenient location.




Electrically Driven Geared Oil Pump.

## A NOVEL DASHBOARD SOCKET.

In automobile practice it has long been customary to mount a lamp on the dashboard in front of the chauffeur so as to illuminate the speedometer, the safety lock, etc., this lamp being commonly supplied with current from a storage battery. It has also been customary to use this lamp as an indicator for the effective operation of the oil pump, by connecting the lamp in a circuit which will be automatically closed when oil is forcibly circulated, but which will be opened when the pump does not operate. While this check on the proper working of the oil pump has been satisfactory in many ways, it involves a darkening of the dashboard when the engine and pump are shut down, thus making it difficulty for the driver of the vehicle to find the keyhole of his safety lock after dark.



Single and Double-Pole Type of Preston Dashboard Socket.

To overcome this objection, Edward S. Preston, of the Chicago Electric Manufacturing Company, has designed a socket in which the circuit may also be closed by pressing the lamp bulb inwardly, thus enabling the user to light his dashboard momentarily by merely pressing against the lamp or against the cowl which hoods the lamp. Such a pressure then closes a shunt around the portion of the circuit which is normally closed by a switch under control of the pressure of the forcibly circulated oil. Our diagrams, showing the connections for both single-pole and double-pole sockets of this type are taken from the Preston patent No. 1,265,513.

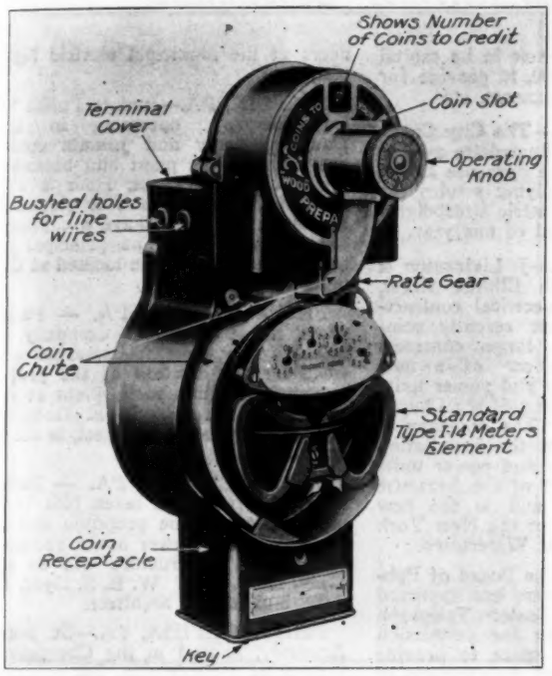
## NEW PREPAYMENT WATT-HOUR METER.

The General Electric Company, Schenectady, N. Y., has developed a prepayment watt-hour meter called the type IP-5 for use on alternating-current circuits. Electrically, it is substantially the widely known standardized type I-14 G-E watt-hour meter. The prepayment device, which is an integral part of the meter, is mechanically operated.

The purpose of the prepayment meter is to make more profitable the accounts of small consumers and of the shifting population of today by lowering the costs for collection and to eliminate the uncollectable accounts from these sources. By also eliminating flat rates to these classes of customers, consumption of electrical energy and consequently fuel is reduced,

and the apparatus investment can be governed by actual requirements of essential operations. In addition, the central station is saved the trouble and expense of cutting service in and out because equipment is undisturbed.

The prepayment mechanism is actuated by a large coiled spring, wound when depositing the coin. The only load imposed on the driving element of the meter




New Prepayment Watt-Hour Meter With Cover Removed.

is that of actuating the tripping device. This requires practically no energy.

Insertion of the first coin and turning of the knob automatically closes the controlling switch. Twenty coins is the maximum for deposit, though the coin box will hold about 100 coins. When energy to the value of the deposit has been recorded the switch is automatically opened until another coin has been deposited. Every precaution has been taken against tampering with or beating the meter. Opening it for inspection does not make the cash box accessible, except to those having the special key for that purpose. The rate of charge can be changed by inserting a new set of rate gears.

## SIMPLEX REFILLABLE FUSE PLUG.

The annoyance of fuse blowing on lighting circuits when no spare fuse plugs are available has led to various efforts to develop plugs of the refillable type, of which the one to be described below is known as the Simplex because of its simplicity. It is built similarly to the standard non-refillable plug as to exterior construction, but the fuse element is attached to screw terminals instead of being soldered to the shell and middle contact. To replace the element requires merely removal of the mica cap, loosening of the screws on the top (inside) terminal and the bottom central contact, insertion of the new fuse wire, tightening of the screws and replacing of the mica cap. Fuse wire of proper rating only should be used. This plug is manufactured by E. W. Powell, 416 Penn avenue. Pittsburgh, Pa.

## ARMORED CORNER INSULATOR FOR FEEDER CABLES.

A new Pittsburgh-type corner insulator, for securely holding feeder cables on curves, is being marketed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

It is provided with a special collar or retaining ring

Corner Insulator With Collar.

for use where the curve is slight and the cable likely to slip off an ordinary insulator. This collar has an extended lip which curves up around the cable and keeps it in the groove regardless of the angle at which the cable turns. This eliminates the necessity for tie

Corner Insulator Without Collar.

wires and saves time in erection. This collar is free to move on the insulator cap, so that after the insulator is screwed to the pin, the collar may be turned until the cable seat is in the proper position best to support the cable.

For sharp curves, the insulator can be used without this collar, as the deep side groove holds the cable firmly in position.

The insulators are made of molded insulation surrounded by a sherardized malleable-iron cap. They are made with a 1-inch pin hole and are furnished in two sizes for feeders of 500,000 and 1,000,000 circular mils, respectively.

## REGENT DECORATIVE GLASSWARE.

Bowls and shades with Rozelle color decorations, made by the Ivanho-Regent Works of General Electric Company, Cleveland, Ohio, are designed to impart to the illuminating feature of the home a color effect to harmonize with the draperies and furnishings. In the manufacture of this ware there is used what is known as Veluria and Ivve glasses; the former a white opal texture that gives a rosy amber glow when lighted; the latter resembling old ivory, the color being made an integral part of the glass. The Rozelle color decorations are applied by a special process to both types of glass.

# Current News

## *Weekly Record of Construction Activities—Conventions*

### EASTERN STATES.

BROOKLYN, N. Y.—Kings County Electric Light & Power Company has awarded a contract for the erection of a new one-story brick addition to its plant at Fifty-fifth street and First avenue, to cost about $10,000. F. S. Lane, 110 West Fortieth street, New York City, is the contractor.

BUFFALO, N. Y.—The City Council is considering plans for the immediate installation of a new electric street-lighting system in Vine, Oak and Elm streets. It is proposed to use arc lighting units.

BUFFALO, N. Y.—New York Telephone Company has recently completed the rebuilding of its telephone lines in the following streets: Main, Jefferson, Niagara and Seventh streets. The company has completed the installation of new lines also in Carrol and Oak streets.

NEW YORK, N. Y.—New York Mutual Gas Light Company, 142 East Fifteenth street, is making rapid progress in the construction of a finishing shop addition to be located at 735 East Twelfth street. The structure will cost about $7900.

NEW YORK, N. Y.—Bonnell Electric Manufacturing Company, manufacturer of electric specialties, has leased its property at 192 Chambers street to Edward D. Depew & Company.

NEW YORK, N. Y.—In connection with the proposed extensions and improvements to be made by the Interborough Rapid Transit Company, 165 Broadway, and to provide for which a bond issue for $37,700,000 is being arranged with the War Finance Corporation, the work will include extensions in the power plants, electric substations, and transmission lines of the company, also improvements in existing electrical apparatus, to cost about $2,391,000; improvements in electric interlocking and other signal apparatus, $3,371,000; electrical machinery and equipment for substations; equipment for electric transmission and distributing systems, $7,886,000.

NEW YORK, N. Y.—Mexican Telegraph Company, 64 Broad street, is having plans prepared for the erection of the proposed building to be located on the block front recently acquired on Broad street, between South William and Stone streets. The structure, which will be known as the All America Cables building, will be an eight-story, and the work of dismantling the structures now located on the site will be commenced at once. Contract for the new building has been awarded to John I. Downey, Inc., 410 West Thirty-fourth street. James A. Scrymser and Edmund L. Baylies are president and vice-president, respectively.

OGDENSBURG, N. Y.—St. Lawrence Marine Railway Company has filed notice of an increase in its capital from $25,000 to $100,000, to provide for extensions and improvements, etc.

SYRACUSE, N. Y.—The City Council is considering the immediate awarding of a contract to the Syracuse Lighting Company for supplying service for the operation of the electric street-lighting system for a period of one year.

SYRACUSE, N. Y.—J. Livingston & Sons, Inc., 405 South Clinton street, operating a general electrical contracting establishment, have recently completed a number of large contracts including the installation of a new electric-lighting system and power units in the four-story building of the Church & Dwight Company. The company is rushing to completion the installation of the lighting system and power units in the large new plant of the Syracuse Rendering Company, and in the new buildings at the plant of the New York Air Brake Company at Watertown.

CAMDEN, N. J.—The Board of Public Utility Commissioners has approved the application of the Eastern Telegraph & Telephone Company for permission to lease certain duct space to provide for the installation and maintenance of electric conduits and cables.

FREEHOLD, N. J.—In connection with the construction of a large new tuberculosis hospital by the County Board of Freeholders, a new power house will be erected, and bids will be received until July 3 for the furnishing of the necessary power equipment, installation of electric wiring, etc., and a new heating system. Charles H. Wyckoff, director.

HARRISON, N. J.—General Electric Company, Schenectady, N. Y., has broken ground for the construction of a large new works at Kingsland avenue and Cross street, to be used as an extension to its local plant.

MAYS LANDING, N. J.—In connection with the erection of the large new plant of the Bethlehem Loading Company, ground has been broken for a new power plant for works operation to have a capacity of about 8000 horsepower.

NEWARK, N. J.—Heller & Merz Company, Hamburg place, has awarded a contract for the erection of the proposed new one-story reinforced concrete power plant at its works, about 37x70 feet in size. E. M. Waldron, Inc., 665 Broad street, Newark, is the contractor.

DOWNINGTOWN, PA.—Downingtown Electric Light & Power Company has made application to the Public Service Commission for a charter for the purpose of furnishing electric service in Downingtown.

LANSDALE, PA. — The Borough Council has announced an increase of 22 per cent in the wages of the engineers at the municipal electric lighting plant.

MIFFLIN, PA.—Juniata Public Service Company, operating in Upper Dauphin, Perry and Juniata counties, has acquired the plant and business of the Middleburg Light, Heat & Power Company, Cynwyd, and is planning to operate the plant to have a capacity of 5000 horsepower. The principal office of the company will be located at Clearfield.

PHILADELPHIA, PA. — Pennsylvania Range & Boiler Company, 2024 North Tenth street, has awarded a contract for the erection of the proposed one-story addition to its plant at Alder and Norris streets. E. E. Hollenback, Inc., 1804 Brandywine street, is the contractor.

PHILADELPHIA, PA. — Bellevue Worsted Mills have taken bids for the construction of the proposed one-story brick and steel power house addition to its plant. The structure will be about 27x85 feet in size. W. E. S. Dyer, Land Title building, is architect.

PHILADELPHIA, PA.—St. Joseph's Academy, located in the Chestnut Hill district of Philadelphia, has awarded a contract for the erection of a one-story brick boiler plant addition at the institution at the city line and Germantown avenue. John McShain, 1610 North street, Philadelphia, is the contractor.

PHILADELPHIA, PA. — Thomas Riley & Company, 1616 Thompson street, have awarded a contract for the construction of a power house and two transformer houses at a cost of $130,078.

PHILADELPHIA, PA.— American Engineering Company, Aramingo and Cumberland streets, has awarded a contract for alterations in its pumping plant at 2636 East Adams street.

PHILADELPHIA, PA.—Bell Telephone Company has awarded a contract for the proposed alterations and improvements in its building at Seventeenth and Arch streets, to cost $19,918. F. L. Hoover & Son, 1023 Cherry street, Philadelphia, are the contractors.

PHILADELPHIA, PA. — Contract has been awarded by Adolph Weicht & Sons, Inc., 730 Rising Sun Lane, for improvements and alterations in its boiler plant to cost $5410. The Coatesville Boiler Works, Morris building, is the contractor.

WAYNESBORO, PA.—Waynesboro Electric Light & Power Company is planning for the immediate installation of a new 500-kilowatt turbine generator at its plant.

WILMINGTON, DEL. — Miller Brothers will install an electric elevator, electric lighting system and other equipment in the building at Tenth and Wilson streets, which they have just recently acquired.

BALTIMORE, MD.—Plans have been filed with the Public Service Commission to establish an electric light, heating and power plant in the Fourth District of Hartford county. Power will be furnished by a dam to be constructed on Deer Creek, near Stansbury's Mill. The capital stock will be $40,000, already paid in.

BEL AIR, MD.—The Public Service Commission has authorized the erection of an electric light, heating and power plant in the Fourth District of Hartford county. The power will be furnished by the dam to be constructed on Deer Creek near Stansbury Mill.

LA RAYNE, MD.—The city has issued $35,000 bonds to improve the water works and electric light plants. Address the mayor.

NORFOLK, VA.—The United States Government, Bureau of Yards & Docks, has taken bids for the construction of a new power and electric light system at its shipbuilding slip No. 1. Estimated cost of the work is $15,000.

MORGANTOWN, W. VA.—West Virginia Traction & Electric Company has recently completed new extensions and improvements in its plant, including the installation of new stoker equipment in the power house, and the construction of about seven miles of new transmission line. The company is making rapid progress in the construction of a new transmission system from Morgantown to Masontown, for supplying power to the plant of the Elkins Coal & Coke Company.

BRUNSWICK, GA. — Butterworth-Judson Corporation, 61 Broadway, New York City, will build an electric light plant to furnish light and power. Address general manager.

## NORTH CENTRAL STATES.

SPRINGFIELD, OHIO.—Ohio Electric Company will erect car barns, storage house and repair shops at an estimated cost of $50,000. Address manager.

EATON, IND.—The council will purchase additional equipment for the electric light plant. Address city clerk.

FRANKFORT, IND. — The City Council has passed an ordinance placing the municipal electric light and power plant in the hands of a citizen committee who will have complete supervision over the service. The men selected are Wallace G. Himmelwright, recommended by the Chamber of Commerce; Walter B. Cohee, choice of the City Council, and D. W. Cross, selected by the other two members. The plant has been in poor condition for several weeks and local factories employed on war orders have been able to work only part time. These conditions demanded speedy action and the council deemed the plan adopted as the best way out of the dilemma.

MUNICH, IND.—The Board of Public Works has directed the Indiana General Service Company to install additional electric lights. Address clerk of the board.

TIPTON, IND.—The city of Tipton has issued 5 to 20-year 5 per cent bonds to the value of $22,000 which must be sold at par. The money is to cover expenses in repairs made to the municipal light and water plant and new machinery which is to be put in.

### DATES AHEAD.

**United States Independent Telephone Association.** Annual convention, Hotel La Salle, Chicago, Ill., June 25-28. Secretary, W. S. Vivian, 19 South La Salle street, Chicago, Ill.

**American Institute of Electrical Engineers.** Annual convention, Atlantic City, N. J., June 26-28. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

**Society for the Promotion of Engineering Education.** Annual convention, Northwestern University, Evanston, Ill., June 26-29. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

**Ohio Electric Light Association.** Annual convention, Cedar Point, Ohio, July 10-12. Secretary, D. L. Gaskill, Greenville, Ohio.

**National Association of Electrical Contractors and Dealers.** Annual convention, Cleveland, Ohio, July 17-20. Secretary, Harry C. Brown, 101 West 40th street, New York City.

**Association of Iron and Steel Electrical Engineers.** Annual convention, Southern Hotel, Baltimore, Md., September 9-14. Secretary, John F. Kelly, McKeesport, Pa.

**Northwest Electric Light and Power Association; affiliated with N. E. L. A.** Annual convention, September 11, 1918. Secretary, George L. Myers, Pacific Power & Light Company, Portland, Ore.

**International Association of Municipal Electricians.** Annual convention, Atlanta, Ga., September 24-27. Secretary, Clarence R. George, Houston, Tex.

**American Electric Railway Association.** Annual meeting, Atlantic City, N. J., October 8 and 9. Secretary, E. B. Burritt, 8 West 40th street, New York City.

**Kansas Public Service Association.** Annual meeting, Kansas City, Kans. October 17-19. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kans.

MT. CARROLL, ILL.—A company has been organized to build an electric interurban railroad between this city and Freeport with the possibility that the route may be extended from here to Rock Island. Address R. H. Campbell.

PORTLAND, MICH.—The citizens have voted to issue bonds for improving the dam on Grand river which furnishes electric light and power.

HORTONVILLE, WIS.—Articles of dissolution have been filed by the Hortonville Light, Heat & Power Company. In the resolutions of dissolution, the officers of the association were authorized to sell the plant to Adolph Haller, the present vice-president.

MILTON JUNCTION, WIS. — An election will be held to decide the question of purchasing the electric light plant. Address city clerk.

MUSCATINE, IOWA.—The council is considering ways and means of installing a municipal lighting plant. Address city clerk.

MUSCATINE, IOWA. — Muscatine Lighting Company has been granted a franchise to construct an electric transmission line to supply the Farmers Electric Light Company with electricity.

NEOLA, IOWA.—The sum of $100,000 in bonds has been voted for improving the light and water system. Address city clerk.

MAYSVILLE, MO.—Estimates are being prepared for improvements necessary at the electric light plant. Address mayor.

SYRACUSE, NEB.—Bids have been opened and contracts awarded for an additional unit for the municipal light plant, and work on the installation of this equipment will commence at once.

## SOUTH CENTRAL STATES.

LOUISVILLE, KY.—Prospects for new electrical business have been opened to the Louisville Gas & Electric Company by the conclusion of arrangements for locating in Louisville a large smokeless powder plant to cost about $4,000,000 and to employ between 4000 and 5000 persons.

DAYTON, TENN.—Plans are under consideration by the Dayton Light & Power Company for the construction of a new electric transmission system to Spring City.

NIXON, TENN. — Nixon Electric Light & Power Company, recently organized, has acquired the plant of the Nixon Electric Company and is planning for the installation of new equipment. W. L. Hoover is manager.

ROCKWOOD, TENN.—Public Light & Power Company, Chattanooga, is planning for the construction of a new electric transmission system from Lenoir City to Rockwood, to carry 66,000 volts.

CHENEYVILLE, LA.—Council is planning a bond issue for $16,000 to provide for the installation of a new electric-lighting system and improvements in the water works.

RAYNE, LA.—A bond issue for $35,000 has been approved, to provide for improvements in the municipal electric plant and water system.

ENID, OKLA.—Arrangements have been completed for the Oklahoma Gas & Electric Company, Enid division, to furnish 75 horsepower in motors to the flour mill at Dover, Okla., as soon as the high tension transmission line connecting the Enid division with this community has been completed. There are a number of additional power prospects at Dover.

SHATTUCK, OKLA. — The City Council has approved a bond issue for $75,000 to provide for the construction of a new electric-lighting plant and improvements in the water system.

YALE, OKLA.—A bond issue for $100,000 is under consideration by the City Council to provide for improvements in the municipal electric-lighting system.

BRACKETTVILLE, TEX.—City is contemplating improvements to electric light plant. Address the mayor.

CHANDLER, TEX.—E. L. Green will construct an electric light and power plant here.

EL PASO, TEX.—An investigation of the water pressure and other details connected with the Elephant Butte dam near Engle, N. Mex., with a view of determining the question of utilizing the storage flow of water for generating electricity has just been made by O. H. Ensign, consulting electrical engineer of the United States Reclamation Service, Los Angeles, Cal.; James Gaylord, electrical engineer of Denver; R. F. Walter, assistant chief of construction of the Reclamation Service, and L. M. Lawson, project manager of the Rio Grande reclamation enterprise. It is planned to construct a large hydroelec-

tric plant at the dam and to transmit the power to El Paso and a number of other towns and mining camps in this region.

GALVESTON, TEX.—Fire recently visited the power plant of the Brush Electric Company causing damage estimated at $50,000.

LUFKIN, TEX. — Lufkin Electric Light & Power Company has filed notice of an increase in its capital from $30,000 to $45,000 to provide for expansion.

## WESTERN STATES

SALT LAKE CITY, UTAH.—A petition embodying a request to extend its system into the town of Perry, Boxelder county, has been filed with the state public utilities commission by the Utah Power & Light Company. Current for heating, lighting and power purposes will be supplied to citizens, it is stated, and no opposition is indicated by the Perry Light & Power Company, which supplies lighting only, and which obtains its current from the Brigham City municipal plant.

BELLINGHAM, WASH.—With the arrival of engineers of the Southwestern Engineering Corporation assurances have been received that initial steps have been taken to erect a new and larger power plant on the property of the Boundary Gold (Post-Lambert) mine in the Mount Baker district. These engineers will make a survey of the property with a view to placing the plant at the most advantageous point. President I. D. Sperry, of the Boundary Gold, says that the first unit which will be built at once will have 75 horsepower and that the second unit which will be constructed later, probably in the fall, will be of the same horse power. Plant will be built on West fork of Silesia Creek.

SEATTLE, WASH.—Council has decided to call for bids for a completed 35,000-kilowatt power plant on the Skagit river from plans and specifications to be prepared by the superintendent of lighting. The council has reduced the estimate of the cost of the first unit of the plant to the extent of $500,000, thereby reducing the estimate to the sum of $5,000,000, or the amount mentioned in the application to the capital issues committee of the federal reserve board. The full capacity of the Skagit river project is estimated at 280,000 horsepower the ultimate cost of which would be between $40,000,000 and $50,000,000.

SALEM, ORE.—Applications of Portland Railway, Light & Power Company for permit to construct the Timothy Meadow reservoir on Oak Creek in Clackamas county and for permit to appropriate 667 feet of stored waters together with waters of Clackamas river have been approved by State Engineer Lewis. On the Timothy Meadow project it is proposed to store 40,000 acre feet of water. Project involves construction of a dam 80 feet high and 440 feet long to cost about $300,000. In the matter of appropriating 667 feet of water, it is proposed to develop 10,000 horsepower at a cost of $1,250,000.

CORNING, CAL.—The city is considering the early installation of a new electric lighting system. It is said that the necessary energy will be supplied by the Northern California Power Company.

EUREKA, CAL.—Eureka Sash & Door Company has recently completed the installation of new power equipment in its plant to provide for an increase in capacity of about 50 per cent. Power for operation is supplied by the Western States Gas & Electric Company.

GRIDLEY, CAL.—Rosenberg Brothers & Company, operating a large rice mill, have had plans prepared for the erection of an addition to their power plant to provide for an increased capacity of approximately 40 per cent.

LOS ANGELES, CAL.—Work has recently been completed and operation inaugurated on the consolidation of the Pacific Telephone Company and the Home Telephone Company with the Southern California Telephone Company. The work, which has taken about 12 months to complete, is estimated to have cost in the neighborhood of $1,000,000.

LOS ANGELES, CAL.—The City Council is considering the immediate installation of a new electric street-lighting system in Fifty-fifth street, commencing at Budlong avenue and extending to Normandie avenue.

OLIVE, CAL.—Plans are under consideration by the council for the immediate installation of an electric street-lighting system.

REDDING, CAL.—California-Oregon Power Company is considering plans for the immediate construction of a high tension line from Castella to Kennett. The work is estimated to cost in the neighborhood of $300,000.

REDDING, CAL.—Northern California Power Company is considering plans for improvements in its power system from Coleman to Hamilton, the work being estimated to cost $100,000.

SANTA BARBARA, CAL. — Plans are under consideration by the City Council for the installation of a new ornamental street-lighting system on Anapamu street, from State street to Anacapa street.

STOCKTON, CAL.—Western States Gas & Electric Company has recently contracted with the Sperry Flour Mills for supplying additional power for the operation of their plant in the amount of 315 horsepower in motors.

STRATHMORE, CAL.—San Joaquin Light & Power Corporation has recently completed the construction of a local substation, which will tie in the systems of the Southern California Edison Company and the Mount Whitney Power & Electric Company with its own power lines.

## PROPOSALS

POWER HOUSE.—Bids will be received by State Board of Control, Olympia, Wash., up to 11 a. m., June 24, for cottage and power house at State School for Girls at Grand Mound, Washington. There will be a general contract, central power plant, plumbing contract and wiring and installation of generator set. Each bid must be accompanied by a certified check for 5 per cent of the price payable to the secretary of state board of control. Drawings and specifications may be obtained at the office of the architect, Julius Zittel, Jamieson building, Spokane, and copies are on file with Heath & Gove, Tacoma; George W. Lawton, Alaska building, Seattle; State School for Girls, Grand Mound, and State Board of Control, Olympia.

SOCKETS.—Bids will be received by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., for weatherproof sockets for delivery at various navy yards. Refer to Schedule No. 1834.

## NEW PUBLICATIONS

"THERMAL EXPANSION OF ALPHA AND OF BETA BRASS" "Scientific Paper No. 321) is the title of a new publication just issued by the Bureau of Standards, embodying an investigation made by the Bureau on the failure of brass articles, rods, bolts, etc., by cracking. Instances have been observed in which cracking occurred in brass articles which had been quickly cooled from a forging or annealing temperature by quenching or otherwise, and it was considered possible that this may have been due to the development of local stresses in the brass during cooling. The present study was made with a view to ascertaining the approximate magnitude of the local stresses which might be set up in heterogeneous brasses of the Munts type metal, and the effect of such stresses upon the mechanical properties of this metal. This paper is now ready for distribution and a copy may be obtained by addressing a request to the Bureau.

## INCORPORATIONS

LINN GROVE, IND.—Linn Grove Light & Power Company has been incorporated with capital of $10,000 to manufacture electric current. The directors include Harry Mershberger, Rufus Mershberger, Albert A. Yordy, George S. Gottschalk and Michael Miller.

SIOUX CITY, IOWA. — Electrical Sales Company has incorporated for the purpose of buying and selling electrical devices and promoting electrical enterprises. I. J. Kelman is president of the company; C. B. Cryslee, vice-president and secretary, and H. E. Trowbridge, treasurer.

MUNFORDVILLE, KY. — Glen-Brook Power Company has incorporated with a capital of $30,000. The incorporators are R. D. Lane, C. R. Garden and H. A. Watkins.

DES MOINES, IOWA.—Norwalk Light & Power Company has filed articles of incorporation, listing a capital stock of 25,000. The new company will have its principal place of business in Des Moines and will furnish light, electricity and power. Officers of the company are Fred. F. Keithley, president; C. A. Willett, vice-president; J. H. De Mar, secretary, and W. R. Thomas, treasurer.

# Trade Activities

## Koch & Sandidge Organizes for Sales Engineering Work—Westinghouse Electric Purchases Krantz Manufacturing Co.

**John F. Godfrey,** manufacturer of coal-handling conveyors, has removed his plant from Elkhart, Ind., to Chicago.

**Pass & Seymour, Inc.,** Solvay, N. Y., has issued P. & S. discount sheet Form 1244, effective May 18, which cancels all other quotations on Schedules A, B and L-sockets, receptacles. Schedule "C"—sign receptacles, Schedules "XA" and "SM"—rosettes and miscellaneous items, and Schedule "D" Uno shade holders.

**Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., has purchased the property, business and good will of the Krantz Manufacturing Company, Inc., Brooklyn, N. Y., manufacturer of safety and semi-safety electrical and other devices, such as auto-lock switches, distribution panels, switchboards, floor boxes, bushings, etc. The supply department of the Westinghouse company will act as exclusive sales agent for the products of the Krantz Manufacturing Company, whose business will be continued under its present name. H. G. Hoke, of the Westinghouse Electric & Manufacturing Company, will represent the supply department at the Krantz factory.

**Koch & Sandidge** is the name of a new firm with offices at 19 South Wells street, Chicago, for handling the sales engineering work for the line of "Jiffy" cutting tools made by the Universal Tool & Appliance Company, Milwaukee, Wis., and similar products. The "Jiffy" cutter has been widely applied for the quick cutting of large holes in metal cabinets, automobile dashboards, steel partitions, ship plates, boilers, tanks, wood fibre, etc. Paul W. Koch, although a partner in this new business, will remain active as president and general manager of the Electrical Sales Engineers, Inc., Chicago, which handles such well known products as Brascolite fixtures and conduit products. Mr. Koch is a graduate of the University of Illinois, class of 1908. J. Howard Sandidge, the other member of this partnership, has been connected with the Cooper Hewitt Electric Company for over six years, being sales engineer in the Chicago district for five years and recently Wisconsin manager with offices in Milwaukee. During Mr. Sandidge's connection with the Chicago office of the Cooper Hewitt company he acted in the capacity of consulting engineer on lighting equipment for various large motion-picture studios. He was at one time also employed by the Commonwealth Edison Company as illuminating engineer in its contract department. He is a graduate of Tulane University, class of 1908. Mr. Sandidge will also become associated with the Electrical Sales Engineers, Inc., in selling products of the Condit Electrical Manufacturing Company. Both Mr. Koch and Mr. Sandidge are well acquainted in the electrical and industrial fields.

**MacGovern & Company,** Inc., 114 Liberty street, New York City, is distributing a booklet in which many splendid types of power machinery, including turbo-units, condenser equipments, rotary converters and motor generator sets, are offered. Brief and comprehensive data concerning each item listed is given in the booklet. Further data and prints of the power machinery marketed by the MacGovern company will be furnished on request.

**Cutler - Hammer Manufacturing Company,** Milwaukee, Wis., has just issued a new leaflet (publication No. 250), illustrating and describing a light weight, substantially built hand magnet, which has become extensively used by smelters and refiners, metal dealers, iron and brass foundries, machinists and others. This hand magnet weighs eight pounds and has a cast aluminum covering, is operated with a simple trigger and is very useful in separating iron or steel from copper, brass, antimony, tin and other non-magnetic substances.

**Bussman Manufacturing Company,** St. Louis, Mo., has just recently issued a very handsome catalog, profusely illustrated and descriptive of a line of fuses designed to meet all conditions. Many new types as well as the older ones are included in the list and all are of the National Electric Code standard. Every fuse made by the Bussman Manufacturing Company bears the "Buss" trade mark, a guarantee of the excellent service and quality of this line. The high standard maintained by these fuses is further signified by the label of the Underwriters' Laboratories, Inc., who periodically test these fuses. Tables of data as well as much other helpful information is contained in the catalog.

**Combustion Engineering Corporation,** New York City, has just issued its Bulletin No. C-1 on the Coxe stoker. This bulletin, of 29 pages, is without any descriptive matter, but contains a number of very fine halftones and drawings showing various parts and arrangements of the well-known Coxe stoker. A number of forms of stoker drive are shown as being most suitable for different forms of station lay-out, depending upon available space, etc. A number of views of boiler rooms give a good idea of the application of this stoker in up-to-date boiler rooms. The last six pages contain cross sectional views of the Coxe stoker under B. & W., Sterling, Edgemore, Rust and Heine boilers. The cross-sectional views of boilers are most instructive, showing as they do various arrangements of baffles, the arrangement of air ducts and design of ash hoppers, so as to permit ready handling of coal. A catalog gotten out, containing illustrations only and without any text other than captions under each illustration, is rather unique.

**Terry Steam Turbine Company,** Hartford, Conn., announces the appointment of E. E. Maher as its Chicago manager with offices located at 1328-29 McCormick building, Chicago. Mr. Maher will have charge of the company's business in that territory, effective May 1.

**General Electric Company** recently suffered a heavy loss when fire visited its storerooms located in South Boston. Electrical supplies valued at $30,000, including supplies for the Signal Corps of the United States Army, were either badly damaged or destroyed. The total loss is estimated at $40,000.

**Booth-Hall Company,** 565 West Washington Boulevard, Chicago, metallurgist, engineer and builder of electric furnaces for the melting, smelting and refining of metals, has just concluded arrangements with the Bradford-Ackerman Corporation, 30 East Forty-second street, New York City, to take entire charge of its sales in the eastern section of the United States. Both C. C. Bradford and A. H. Ackerman, members of this company, have had extensive experience in the sale of electrical apparatus. They are both graduate electrical engineers. Mr. Ackerman was formerly vice-president and general manager of the United States Light & Heat Corporation, Niagara Falls, N. Y., and Mr. Bradford was general sales manager for the same company. Their acquaintance is a broad one throughout the trade in the East and their vast experience in the handling of electrical problems will be of great advantage to all.

**Skinderviken Telephone Equipment Company,** 2136 North Clark street, Chicago, Ill., has issued a booklet entitled "Latest Inventions for the Telephone," introducing a number of devices invented and patented by J. Skinderviken, president and general manager of the company. In this booklet a very unique transmitter button made for both magneto and common battery telephones is illustrated and described in detail. It is a small, cone-shaped, gold plated, metal case or button, containing the electrodes and granulated carbon will transmit sound in whatever position held and enables anyone with or without previous telephone experience to take care of transmitter complaints. It is claimed that this device will effect a material saving in batteries, and consequently many trips and inconveniences unavoidable with the old transmitter are eliminated. The Skinderviken automatic battery saver, a simple and inexpensive device, which is designed to save frequent battery renewals in local battery telephones is also illustrated and described in detail.

# Recent Patents

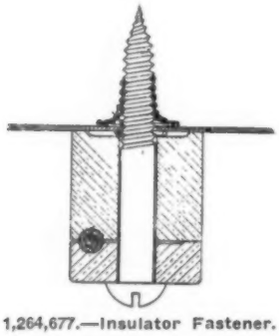
## Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

*A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.*

**Making Line Welds** (1,264,058).—Instead of interrupting the current between the making of successive welds, Henry Geisenhoener continuously applies a welding current to the work, but varies the welding pressure between the electrodes during successive intervals. He also provides motor-driven mechanism for moving at least one of the electrodes to produce a line weld.

**Electrical Drawer-Lock** (1,265,054).—Magnetically released latches for sliding bolts are described as means for locking the furniture drawers in the patent issued to Bryant W. Clauson, of Rexford, Kans.

**Insulator Fastener** (1,264,677).—A coil of wire on the opposite side of a sheet of metal forms a nut for an ordinary wood screw, according to this patent to Clifford H. Murrell, of



1,264,677.—Insulator Fastener.

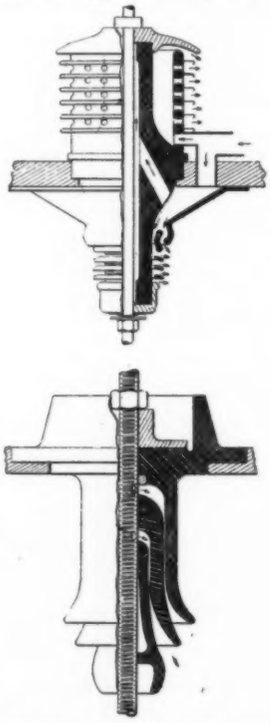
the Murrell Fastener Co., Roanoke, Virginia.

**Electric Measuring Instruments** (Reissue Patent 14,464).—To overcome the electromagnetic attraction or "freezing" action encountered with long-scale ohmmeters or the like, Harold E. Trent, of Murraysville, Pa., employs a winding so arranged as to neutralize the effect of the controlling winding only when the movable member of the instrument is in its initial position. For this purpose he uses a winding on a polar projection of one of the pole pieces.

**Electrical Torpedo-Net** (1,264,926).—As designed by Albert Hedina, of La Porte, Ind., a frame carries a series of relatively spaced conductors insulated from each other and held under tension by springs. These conductors are alternately opposite in polarity, so that the circuit to which they are connected will be closed by a torpedo crossing them.

**Making Cyanogen Compounds** (1,264,949).—Alkali silicate, together with lime and reducing agents, are heated in an electrical furnace while exposed to the action of nitrogen, thus forming cyanogen compounds according to this patent to Axel R. Lindblad, of Ludvika, Sweden.

**High-Tension Insulator** (1,264,674).—For high-tension insulators, or for low-tension service in electrochemical or electrometallurgical processes where acid or metallic vapors make the familiar types inadequate, Erwin



No. 1,264,674.—High-Tension Insulators.

Moeller, of Brackwede, Germany, provides passages through which a non-conducting fluid can continuously flow between the parts comprising the composite insulator. The insulator itself may be of many different forms, two of which are shown in our illustrations.

**Electric Cutout** (1,265,576).—The fuse number of this plug cutout consists of a U-shaped metal yoke and a metal bar secured against the ends of the U by a readily fusible solder. Patent assigned by Gilbert Wright to the General Electric Co.

**Hard-Rubber Substitute** (1,265,018).—To make a cheap substitute for hard rubber, Paul Pickl, of Chicago, grinds 90 parts of elaterite (an elastic bitumen mined in the West) with from three to five per cent of resinous material and two or three per cent of sulphur, and heats the mixture.

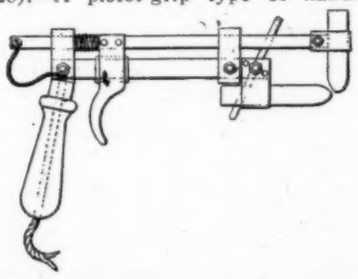
**Fuse Device** (1,261,121).—To dissipate the arc of a blowing fuse, Edmund O. Schweitzer and Alfred Herz, both of the Commonwealth Edison Co., of Chicago, use a pair of arc-dissipating horns mounted on conductors which extend through aperture in the casing of the device to the terminals of the fuse.

**Hedge Trimmer** (1,265,178).—For a quick-acting and powerful hedge trimmer, William A. Combouzon, of Baton Rouge, La., mounts an electric motor on one of the knife blades and reciprocates the other blade by electric power.

**Electric Water-Heater** (1,265,213).—To regulate the action of an electric water-heater, Otto A. Knopp, of Oakland, Cal., mounts his heater in an expansible shell and provides means for automatically varying the wattage of the inclosed heating element according to the expansion and contraction of this shell.

**Electric Arc Welding** (1,265,342).—By this welding apparatus, Otis A. Kenyon, of New York City, starts the arc with a maximum current and then automatically reduces it at a definite rate to a definite value. Upon cessation of the arc, the current is automatically increased at a definite rate to its starting amperage.

**Electric Welding Apparatus** (1,264,326).—A pistol-grip type of handle



1,264,326.—Electric Welding Apparatus.

affords convenient means for regulating the length of the arc in the welding tool patented by John P. Nikonow, of Dayton, Ohio.

**Arc-Soldering Electrode** (1,265,453).—For electrically depositing high-speed steel, Ernest Henry Jones, of Canonbury, London, England, uses a mild-steel channel containing both a cast-iron rod and a suitable proportion of compounded materials for forming the "high-speed" alloy, and surrounds all with a fusible covering.

# Men in Service

## William J. Hammer Commissioned Major in Inventions Section—E. W. Roth Transferred to Bureau of Standards

A. F. HOGAN, of the engineering department of H. M. Byllesby & Company, Chicago office, has entered the United States Signal Service, Aviation Corps, and is now receiving training at the Champaign-Urbana field.

C. O. MALTHANER, formerly with the Tri-State Telephone & Telegraph Company, St. Paul, Minn., is now an instructor in electricity and radio in the Signal Corps School at Fort Leavenworth, Kans. Mr. Malthaner was appointed a sergeant on May 1.

ERNEST W. ROTH, formerly sergeant in the Ordnance Department in the National Army at Camp Dodge, who, prior to that time, was Minneapolis manager for the Lindsley Brothers Company, has been transferred to the Bureau of Standards at Washington, D. C., to engage in research in the Chemical Department.

IRVING NATIONAL BANK, New York City, has inaugurated a system whereby members of the American Expeditionary Forces are enabled to obtain money in any allied country by cashing their personal checks on their own banks. It is expressly adapted to meet the exigencies of war conditions as it eliminates all the dangers of loss or destruction of currency, travellers' checks or letters of credit. No outlay is necessary before leaving America and the individual's bank account is not disturbed until his check is presented to his home bank for payment. Furthermore, as money need be obtained only as required, loss through the reconversion into dollars of unexpected funds is avoided; and as such checks are always payable in the currency of the country where cashed, one need carry from place to place only sufficient money for immediate needs.

This service is the outgrowth of an agreement with three important European banks, all of which have experienced organizations and are thoroughly acquainted with the requirements of men on active military duty. The operation of the plan in France is entrusted to Messrs. Cox & Company (France) Ltd., the official army paymasters of the British government. They have a network of facilities throughout that country including branches in the war zone which are constantly accessible to all the allied units. In Great Britain such checks may be cashed at the London Provincial & South Western Bank or at any of its five hundred and sixty branches. The Banca Italiana di Sconto affords similar advantages throughout Italy. Any American bank may provide its customers with these facilities through the Irving National Bank; in return the Irving asks no commission whatever and offers its full co-operation with the financial institutions of this country to render this service of practical assistance to all persons going abroad.

### ROLL OF HONOR.

*The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.*

THE ELECTRICAL REVIEW *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

BELL TELEPHONE COMPANY OF PENNSYLVANIA in the June issue of Telephone News publishes a supplementary roll of honor, bearing the names of 123 employees of the Bell organization enlisted in various branches of Government service.

DAN LESLIE LINDSLEY, son of C. P. Lindsley, president of the Lindsley Brothers Company, Chicago, has finished his course of training at Rockwell Field, North Island, San Diego, Cal., and has been commissioned a second lieutenant, Signal Reserve Corps, Aviation Section, and has been ordered to Camp Dick, Dallas, Tex., for further training as a Reconnoissance Pilot.

EDMUND W. GILPIN, formerly connected with the Bell Telephone Company at Harrisburg, Pa., was recently commissioned a second lieutenant. Lieutenant Gilpin is a graduate of the Third Officers' Training Camp at Camp Hancock, and since receiving his commission has been assigned to the Machine Gun Company of the One Hundred and Tenth Infantry.

L. G. MANN, secretary to P. S. Arkwright, president of the Georgia Railway & Power Company, Atlanta, Ga., and a short time ago appointed assistant secretary of the company, has been called to the U. S. Naval Reserve. Mr. Mann volunteered for the service some time ago and was accepted, but continued his duties while awaiting his call for service.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS in the June issue of Proceedings publishes a supplementary list containing the names of 45 members who have answered the call to the colors. The Institute now lists the names of 843 members in Government service, and of this number 661 are in the U. S. Army, 167 in the Navy, and 15 in the British and French Armies.

H. H. LYONS, superintendent of the Ordway division of the Arkansas Valley Railway, Light & Power Company, has enlisted in Government service, and will take special training at Fort Collins.

G. WALLACE CRAVEN, formerly in charge of the application department of the Louisville Gas & Electric Company, is now serving the colors with Company F, 6th U. S. Engineers in France.

DAKOTA CENTRAL TELEPHONE COMPANY, Aberdeen, S. Dak., in a recent issue of Telephone News Bulletin publishes its roll of honor, containing the names of 34 employees now serving with the colors.

WILLIAM J. HAMMER, consulting electrical engineer, 55 Liberty street, New York City, was recently appointed a major in the Inventions Section, War Plans Division of the National Army, and is at present located at the War College, Washington, D. C. He was born at Cressona, Schuykiil county, Pa., February 26, 1858, and received his early education in private and public schools at Newark, N. J., supplemented by lectures and study here and abroad. He became an assistant to Edward Weston of the Weston Malleable Nickel Company, Newark, N. J., in 1878, and in December of the following year entered the employ of Thomas A. Edison in his laboratory at Menlo Park, N. J.

In 1881 Major Hammer was sent abroad by Mr. Edison, becoming chief engineer of the English Edison Electric Light Company, and associated with E. H. Johnson, general manager, he constructed the Holborn Viaduct central electric light station in London, the first central station ever constructed for incandescent electric lighting. He later took entire charge of the organization of the working force of the German Edison Company, laying out and supervising all the installations of the company until the fall of 1884, when he returned to America. In 1884, together with Edward H. Johnson and Frank J. Sprague, he incorporated the Sprague Electric Railway & Motor Company.

Major Hammer was at one time general manager and chief engineer for the Boston Edison Electric Illuminating and later took up special expert work for the parent Edison Electric Light Company in New York. In 1880 he opened an office in New York City as a consulting electrical engineer. Much of Major Hammer's professional work has been in connection with tests, investigations and reports upon electrical properties and inventions, and has done considerable original work in his laboratory in connection with selenium, radium, X-rays, wireless, etc. He is a fellow and a life member of the American Institute of Electrical Engineers, a member of the New York Electrical Society and fellow of the American Association for the Advancement of Science.

# Personal

## E. H. Jacobs Made General Manager Electrical Engineers Equipment—W. F. Wells Elected President N. E. L. A.

CHARLES A. MCCUNE, formerly chief engineer of the Commercial Acetylene Company, New York City, has become sales manager of the Page Steel & Wire Company, 30 Church street, New York, and will devote his efforts to sales and service in connection with Armco welding rods.

E. H. JACOBS, until recently chief engineer of the Electrical Engineers Equipment Company, Chicago, has been appointed general manager, succeeding Frank H. Getts, who died recently. Mr. Jacobs has had an extended experience in the field of electrical engineering and has been identified with a number of very important projects. He was connected with the General Electric Company for 18 years, spending considerable time in the testing, switchboard and drafting departments. He was at one time in charge of the switchboard engineering department, and for six years was in charge of the station-control-apparatus department. During the last two years of his connection with the General Electric Company, Mr. Jacobs made investigations and recommendations for operations and extensions in power systems, covering the entire United States and Canada. He was made chief engineer of the Electrical Engineers Equipment Company in October, 1916.

E. H. Jacobs.

WALTER FARRINGTON WELLS, newly elected president of the National Electric Light Association, is vice-president and general manager of the Edison Electric Illuminating Company of Brooklyn. He was born in Rahway, N. J., in 1870, and was educated at Rutgers College. He joined the forces of the Brooklyn Edison Company in 1892 as a draftsman, and from 1894 to 1897 acted as electrical superintendent of the company, which position he resigned to become assistant general manager of the Manhattan Electric Light Company, one of the pioneer electrical supply companies of Manhattan. When the New York Edison Company was organized, Mr. Wells was appointed one of the district superintendents of the operating department. He superintended the installation of the electric plant at the immense Waterside station and upon its completion, became superintendent in general charge of its operation. In 1905 he returned to Brooklyn as general superintendent of the Brooklyn Edison Company, in charge of a great many of its activities. On January 3, 1913, he was elected vice-president and general manager, also director, the position he now holds. Mr. Wells is also vice-president and general manager and director of the Kings County Electric Light & Power Company, vice-president and director of the Amsterdam Electric Light, Heat & Power Company, and a director of the National City Bank of Brooklyn. Mr. Wells has been active for many years in the National Electric Light Association, having held the offices of treasurer, second vice-president and vice-president. He was also presiding president during 1915 and 1916 of the Association of Edison Illuminating Companies. In June, Rutgers College conferred upon him the honorary degree of Electrical Engineer. He is a Fellow of the American Institute of Electrical Engineers, a member of American Society of Mechanical Engineers, Franklin Institute, Illuminating Engineering Society, Merchants Association of New York, Brooklyn Chamber of Commerce, New York Electrical Society, and Brooklyn Engineers Club.

### Obituary.

JOHN BOTTOMLEY, vice-president of the Marconi Wireless Telegraph Company of America, died suddenly June 16 in New York City. Mr. Bottomley became associated with Mr. Marconi in 1898, taking up the very responsible task of introducing wireless telegraphy to the American world of commerce. When the immense developments of the system required the reorganization of affairs, he became, in 1902, general manager, secretary and treasurer of the company. He was later nominated as second vice-president, and subsequently elected vice-president, the position he held at the time of his death.

CHARLES D. HASKINS, formerly well known in electrical and telegraph circles, died recently in Seattle, Wash. Mr. Haskins entered the telegraph business in 1866, at the age of 13, holding a position as operator at Littleton, N. H. In later years Mr. Haskins became an expert telegraph electrician and was transferred successively to more important posts, Portland, Me., Bangor, Me., Boston, Mass., and New York. In 1872 he became foreman of the Western Union Telegraph Company's factory, at that time located at 62 New Church street. Shortly thereafter the Western Electric Company was organized and the Western Union shop taken over, Mr. Haskins remaining as superintendent. He subsequently became personal aid and adviser to E. M. Barton, president of the company, and later acted as patent attorney, remaining in that capacity until 1900. For the past two or three years Mr. Haskins had established himself as a patent attorney in Seattle and acquired the reputation of being one of the best patent attorneys on the Pacific Coast.

CYRUS O. BAKER, the noted platinum refiner and importer, died suddenly on June 13 at his home in Briarcliff, N. Y., after a brief illness. Word of his death was received at the N. E. L. A. convention and appropriate resolutions of sympathy offered by Charles W. Price. Mr. Baker was one of the veteran workers in the interests of the association and was for many years its very able and efficient master of transportation. He was one of the few honorary members of the organization. The deceased was for many years quite prominent in electrical circles, supplying probably all the platinum which was used by the incandescent lamp manufacturers and the telephone switchboard manufacturers. Of late Mr. Baker had not been so active in the electrical business. He was a prominent member of the Lotus Club of New York. It is believed that the recent ill-advised and unjust attack on Mr. Baker's platinum company in Congress caused worry that hastened his death. It can be said in this relation that a more patriotic, loyal and upright American citizen never lived than Cyrus Osborne Baker, and scores of friends know this to be true. The funeral was held Monday afternoon, June 17, in Newark, N. J.

Cyrus O. Baker.

# Financial News

## Change in Finance Act Sought by Utilities.

Public utilities interests, whose managements are unable to show sufficient profit to enable them to borrow advantageously at the banks or of the War Finance Corporation, recently started a movement to have the finance corporation act altered in the hope that the Government will make loans where the banks have refused to do so.

The board of directors of the War Finance Corporation is refusing to make advances to utilities companies on the grounds that the Government is not managing utilities as it is the railroads and that the utilities should borrow from the banks familiar with the credit standing of the companies. Such loans may be then taken up with the finance corporation, secured by the promissory note of the banks. Since the banks are unwilling to lend, because of the showing of earnings, the finance corporation is turning down applications for assistance.

It is understood that of about 200 applications filed with the War Finance Corporation, only two have been favorably acted upon. Within the next two years about $400,000,000 of securities of the utilities companies will fall due and if the war is still on the outlook is for a discontinuance of dividends and possibly receiverships for the least successfully managed of the companies.

Utilities concerns are seeking the influence of the banks in an effort to have the finance corporation act modified. With that object the banks in larger cities are asked to name a committee which, if called upon, will go to Washington for a conference over the situation. So far as can be learned there is no disposition on the part of local banks to undertake the refunding of public utilities securities where the showing of earnings is unsatisfactory.

## Washington Water Power Values for Rate Making.

Public Service Commission of Washington has made a valuation of the light and power properties of the Washington Water Power Company in Eastern Washington and Idaho at $20,500,000 for rate making purposes. Of this amount $16,700,000 is fixed on properties in Washington and the balance is in Idaho. Market value of the properties is given at $22,500,000. Cost of reproducing is placed at $16,133,328; authorized capital stock is $20,000,000, and total indebtedness is $9,047,000. Cost of construction and equipment is fixed at $19,529,329. Street and interurban lines are not included in this valuation because of the merger now being carried through at Spokane between the Washington Water Power Company and the Spokane Traction Company. The earnings of the company since it was organized in 1889 are placed at $9,366,287, this total including electric line revenue. The Commission was solicited by the company to fix the cost of reproduction at present prices, but held that such a course would be contrary to law and an injustice to the patrons. The cost price is applied on property added since 1915 when the valuation began, down to December 31, 1917, when the valuation closes. The Washington Water Power Company operates four hydroelectric plants on the Spokane river from which 78,000 horsepower is developed. In making the valuation the Idaho public service commission joined with that of Washington.

## Utica Gas & Electric Bonds Offered.

Harris, Forbes & Company and Coffin & Burr are offering $1,260,000 Utica Gas & Electric Company refunding and extension mortgage 5 per cent bonds, due 1957, at 89½, and interest to yield about 5.67 per cent. The bonds are exempt from New York state, county and municipal personal property taxes. Of the present 4 per cent normal federal income tax the company pays the 2 per cent tax deductable at the source. The company is capitalized at $2,000,000. It has paid dividends at the rate of 10 per cent per annum since April, 1913.

## Puget Sound Traction Notes Sold.

Puget Sound Traction, Light & Power Company, largest public utility in Stone & Webster group, has sold an issue of $12,250,000 7 per cent three-year mortgage gold notes to a syndicate composed of Lee, Higginson & Company, Harris, Forbes & Company, and Estabrook & Company.

The company has $10,057,000 6 per cent mortgage bonds maturing February 1, 1919, which will be called for payment at 100 and interest on August 1, 1918. New notes are issued to provide funds to pay off bonds and to reimburse the company, in part, for extensions and additions already made. It is understood the notes will be offered shortly to the public at a price to yield about 7¾ per cent.

## Public Service Property Values Lessened.

Electric property valuations in Washington have been decreased $513,900 and telegraph companies $121,815 for taxation purposes this year as compared to 1917, according to schedules made by Commissioner Clark R. Jackson of the state tax department. The 1918 valuation made by the tax commissioner on electric lines amounts to $43,970,875, as compared to $44,484,775 in 1917. The Western Union Telegraph Company drops from $746,531 to $628,084 and the Postal Telegraph Company from $142,616 to $139,248. In the changes on Seattle properties, the Puget Sound Traction, Light & Power Company is reduced by $20,000; the Seattle & Rainier Valley Railway Company $100,000. The Tacoma Railway & Power Company is reduced $65,000, while the Western Washington Power Company, a Seattle cross-town line, is increased by $15,000; the Puget Sound International Railway & Power Company is increased $25,000; the Pacific Traction Company, running from Tacoma to Camp Lewis, $18,000; Olympic Light & Power Company is raised $32,000, and the Yakima Valley Transportation Company $13,000. The detailed tax values are given in the following schedule prepared by the state department on electric and telegraph companies:

| | 1917. | 1918. |
|---|---|---|
| Puget Sound International Railway & Power Company | $ 1,275,000 | $ 1,300,000 |
| Grays Harbor Railway & Light Company | 1,050,000 | 1,050,000 |
| Lewiston - Clarkston Transit Company | 13,700 | 22,000 |
| Olympia Light & Power Company | 330,000 | 362,000 |
| Pacific Traction Company | 272,000 | 290,000 |
| Puget Sound Traction, Light & Power Company | 18,681,000 | 18,661,500 |
| Seattle & Rainier Valley Railway Company | 1,200,000 | 1,100,000 |
| Tacoma Railway & Power Company | 3,450,000 | 3,385,000 |
| Western Washington Power Company | 37,500 | 39,000 |
| Willapa Electric Company | 87,000 | 87,000 |
| Pacific Northwest Traction Company | 2,542,500 | 2,542,500 |
| Puget Sound Electric Company | 2,800,000 | 2,800,000 |
| Spokane & Inland Empire Railroad Company | 8,300,000 | 8,000,000 |
| Washington Water Power Company | 3,372,000 | 3,245,250 |
| Walla Walla Valley Railway Company | 325,000 | 325,000 |
| Yakima Valley Transportation Company | 392,250 | 405,500 |
| Totals | $44,484,775 | $43,970,875 |
| Western Union Telegraph Company | 746,531 | 628,084 |
| Postal Telegraph Company | 142,616 | 139,248 |

These valuations are to be presented to the state board of equalization, which meets in September. They are figured in full. The properties will be taxed in the various counties according to the percentage assigned by the state board.

## Relief Refused Traction Company.

Application of the Puget Sound Traction, Light & Power Company for relief from franchise obligations has been dismissed by the state public service commission of Washington, the commission holding that the points of law were decided recently in a case started at Tacoma. The relief sought by the company included obligations to pave between its tracks, pay 2 per cent of its gross receipts to the city and its proportion of the expenses of certain bridge construction. The action was brought by the company in July, 1915. On May 14, 1917, after a similar case from Tacoma had been decided by the commission in favor of the city, Corporation Counsel Hugh M. Caldwell, of Seattle, who appeared in the Tacoma case, filed a motion for dismissal of the Seattle case. The motion was argued in July, 1917, and has been held under advisement by the commission ever since.

## Colorado Springs Company Granted Increased Rates.

The Colorado Springs Light, Heat & Power Company has been granted increases in gas and electric rates by the Colorado Public Utilities Commission.

The electric rate for residence and commercial lighting was fixed by the commission at 9½ cents per kilowatt hour. Despite the abnormal operating conditions brought on by the war, this rate still is ½ cent less than that paid by consumers in Colorado Springs in 1915, before the commission made its first investigation into the rates of the Colorado Springs Light, Heat & Power Company. Advances of 2 mills per kilowatt hour for service to large power consumers, and 1 cent per kilowatt hour for power service to consumers using a relatively small amount of current, were authorized.

Compared with 1917, the cost of coal to the Colorado Springs Light, Heat & Power Company in 1918, will show an increase of $29,000, while a pay roll increase of $12,500, and an estimated increase of $3,000 in taxes are the principal items in the increased cost of operation. The net loss in revenue through the cessation of operation of the Portland mill at Colorado City is $10,000. The increased rates, however, are designed to meet only about 60 per cent of the increased operating costs, according to the findings of the commission.

## Annual Report of Middle West Utilities.

According to the report to stockholders of the company, combined gross earnings of subsidiaries of the Middle West Utilities Company for the fiscal year ending April 30, 1918, were $12,157,121, showing an increase of $2,536,905 over the preceding year. Net earnings reached $3,594,432, compared with $3,502,756 for 1916. The total income accruing to the Middle West company was $1,955,210, compared with $1,824,069, and net income $1,041,601, compared with $1,026,584.

Samuel Insull, president of the company, in his report to stockholders says:

"During the last 12 months the public service business has suffered decidedly from increased costs of practically everything entering into its operation. Particularly has this been true of fuel. The aggregate increase in the cost of fuel in the subsidiary companies due to increased price alone amounted to $618,000.

"In order to offset the increased operating cost the various subsidiaries have been very actively applying to the state and local authorities for increases in their rate schedules. As a result of increased rates allowed for service or by increasing the selling price of other products the subsidiary companies have secured increases amounting to $540,000 per annum. These increases have been reflected very slightly in the subsidiary companies' earnings, contained in the annual report since as of April, the last month of the fiscal year, only $326,000 per annum had become effective. Applications for further increases of approximately $600,000 per annum have been applied for."

### INCOME ACCOUNT.

The income account of the Middle West Utilities Company for the fiscal year compares:

| | 1918. | 1917. |
|---|---|---|
| Interest received on bonds | $ 692,662 | $ 564,789 |
| Dividends received from subsidiaries | 393,811 | 600,071 |
| Other dividends received | 10,145 | 12,851 |
| Sundry interest | 228,203 | 189,453 |
| Profits from sale of securities to subsidiary companies and others | 864,485 | 225,233 |
| Profits arising from revaluation of securities and from valuation of securities hitherto carried at nominal values — values determined by board of directors | 116,654 | ..... |
| Securities received from services rendered | 60,661 | 196,803 |
| Fees for engineering, etc. | 93,586 | 84,825 |
| Total income | $1,955,210 | $1,824,069 |
| Deductions— | | |
| Administration expenses. | $ 194,921 | $ 170,344 |
| Miscellaneous charges, taxes | 43,314 | 86,914 |
| Interest on notes, bonds, loans | 675,873 | 540,227 |
| Net income | $1,041,601 | $1,026,584 |
| Preferred dividends | 720,000 | 645,862 |
| Common dividends, cash | 192,977 | 142,130 |
| Common dividends, stock and script | 193,009 | ..... |
| Profit and loss surplus | $ 64,887 | $ 238,592 |
| Appropriated toward writing off discount on company's own securities | 95,000 | 90,000 |
| Total | $ 159,887 | $ 148,592 |
| Previous surplus | 1,546,949 | 1,398,356 |
| Total surplus | $1,887,565 | $1,546,948 |

## Dividends.

Eastern Texas Electric Company has declared the semi-annual dividends of $3 on preferred and $2.50 on common stock, both payable July 1 to stock of record June 14.

Asheville Power & Light Company has declared a quarterly dividend of 1¾ per cent on preferred stock, payable July 1 to stock of record June 15.

Carolina Power & Light Company has declared a quarterly dividend of 1¾ per cent on preferred stock, payable July 1 to stock of record June 15.

Dayton Power & Light Company has declared a quarterly dividend of 1½ per cent on preferred stock, payable July 1 to stock of record June 20.

West End Street Railway Company has declared a semi-annual dividend of $2 per share on preferred stock, payable July 1.

Western Union Telegraph Company has declared a dividend of 1¾ per cent, payable July 15 to stock of record June 20.

Yadkin River Power Company has declared a quarterly dividend of 1¾ per cent on preferred stock, payable July 1 to stock of record June 15.

American Gas & Electric Company has declared a quarterly dividend of 2½ per cent and an extra 2 per cent in stock on common stock, payable July 1 to stock of record June 17; also the regular quarterly dividend of 1½ per cent on preferred stock, payable August 1 to stock of record July 15.

United Electric Company of New Jersey has declared a semi-annual dividend of 2½ per cent, payable July 1 to stock of record June 29.

Baltimore Electric Company has declared a semi-annual dividend of 2½ per cent on preferred stock, payable July 1.

The Bell Telephone Company has declared a dividend of 2 per cent, payable July 15 to stock of record June 29.

United Electric Company of New Jersey has declared the regular semi-annual dividend of 2½ per cent, payable July 1 to stock of record June 29.

## Earnings.

### NIAGARA, LOCKPORT & ONTARIO POWER COMPANY.

The consolidated income account of the Niagara, Lockport & Ontario Power Company and Salmon River Power Company, for year ended December 31, 1917, compares as follows:

| | 1917. | 1916. |
|---|---|---|
| Gross profit | $1,227,225 | $1,156,119 |
| Balance after expenses and taxes | 771,883 | 964,382 |
| Surplus after charges | 212,983 | 406,825 |

### UNITED GAS & ELECTRIC CORPORATION.

Comparative statement of subsidiary company earnings of United Gas & Electric Corporation, is as follows:

| | 1918. | 1917. |
|---|---|---|
| April gross | $1,337,211 | $1,290,844 |
| Net after taxes | 389,749 | 516,743 |
| Surplus after charges | 73,762 | 224,056 |
| 12 months' gross | 16,267,528 | 15,584,047 |
| Net after taxes | 5,477,316 | 6,388,137 |
| Surplus after charges | 1,815,472 | 2,896,974 |

### PACIFIC GAS & ELECTRIC COMPANY.

For the 12 months ended April 30—Gross, $20,288,830, increase $1,459,987; net after taxes, $13,296,364, increase $2,015,878; total income, $7,509,062, decrease $516,142; interest charges, $4,135,689; increase $250,313; bond discount and expense, $185,109, increase $8,002; dividends accrued on preferred stocks, $1,487,802, increase $71,137; surplus, $1,700,462, decrease $845,594.

### MANHATTAN ELECTRICAL SUPPLY COMPANY.

For the four months ended April 30, 1918, sales of the Manhattan Electric Supply Company were 51,711,160, or at the rate of approximately $5,150,000 annually. Net sales for the entire year 1917 were $5,234,323 and net profits $625,884. The amount applicable for the common stock in 1917 was equal to $15.85 a share. Net quick assets exceed $2,000,000, against a total capitalization of $1,370,500 7 per cent first preferred stock; $347,100 7 per cent cumulative second preferred stock, and $3,000,000 common stock. Since October 1, 1917, the company has retired out of earnings $129,500 first preferred stock and $152,900 second preferred stock.

### KEYSTONE TELEPHONE.

| | 1918. | 1917. |
|---|---|---|
| May gross | $ 134,339 | $ 131,305 |
| Net | 55,850 | 64,124 |
| Surplus after charges | 27,234 | 36,332 |
| 5 months' gross | 673,365 | 645,574 |
| Net | 289,257 | 312,569 |
| Surplus after charges | 39,715 | 115,505 |

### NEW ENGLAND COMPANY POWER SYSTEM.

| | 1918. | 1917. |
|---|---|---|
| April gross | $ 242,565 | $ 202,400 |
| Net after taxes | 136,839 | 117,852 |
| Surplus after charges | 86,261 | 68,432 |
| 4 months' gross | 1,013,443 | 814,603 |
| Net after taxes | 414,517 | 422,749 |
| Surplus after charges | 212,414 | 224,930 |

### HAVANA ELECTRIC RAILWAY, LIGHT & POWER COMPANY.

| | 1918. | 1917. |
|---|---|---|
| April gross | $ 663,345 | $ 534,613 |
| Net after taxes | 361,968 | 304,418 |
| Surplus after charges | 247,835 | 150,571 |
| 4 months' gross | 2,567,536 | 2,131,823 |
| Net after taxes | 1,398,335 | 1,223,426 |
| Surplus after charges | 932,785 | 617,868 |

### CHATTANOOGA RAILWAY & LIGHT COMPANY.

| | 1918. | 1917. |
|---|---|---|
| April gross | $ 145,620 | $ 111,840 |
| Net | 38,554 | 38,911 |
| Interest, etc. | 30,996 | 29,649 |
| Surplus | 7,558 | 4,262 |
| 12 months' gross | 1,503,319 | 1,260,774 |
| Net | 223,670 | 384,813 |
| Interest, etc. | 364,362 | 358,215 |
| Surplus | 140,692 | 26,598 |

### WESTERN STATES GAS & ELECTRIC COMPANY.

Net earnings of Western States Gas & Electric Company for the month of April were 16.7 per cent greater than for the corresponding month of 1917, while gross earnings increase for the same period was 15.7 per cent. Comparative statement is as follows:

| Month of April— | 1918. | 1917. |
|---|---|---|
| Gross earnings | $ 128,407 | $ 110,810 |
| Net earnings | 68,781 | 58,935 |
| Year ended April 30— | | |
| Gross earnings | 1,474,165 | 1,282,481 |
| Net earnings | 647,946 | 608,872 |

## WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

| Public Utilities— | Div. rate. Per cent. | Bid June11. | Bid June18. |
|---|---|---|---|
| Adirondack Electric Power of Glens Falls, common | 6 | 12½ | 12½ |
| Adirondack Electric Power of Glens Falls, preferred | 6 | 70 | 70 |
| American Gas & Electric of New York, common | 10+extra | 87 | 88 |
| American Gas & Electric of New York, preferred | 6 | 40 | 40 |
| American Light & Traction of New York, common | .. | 187 | 184 |
| American Light & Traction of New York, preferred | 6 | 94 | 94 |
| American Power & Light of New York, common | 4 | 40 | 40 |
| American Power & Light of New York, preferred | 6 | 68 | 68 |
| American Public Utilities of Grand Rapids, common | .. | .. | .. |
| American Public Utilities of Grand Rapids, preferred | 6 | .. | .. |
| American Telephone & Telegraph of New York | .. | 99 | 98½ |
| American Water Works & Elec. of New York, common | .. | 4¾ | 4½ |
| American Water Works & Elec. of New York, particip | 7 | 12½ | 12½ |
| American Water Works & Elec. of New York, first preferred | .. | 56½ | 56 |
| Appalachian Power of Bluefield, common | .. | 40 | 40 |
| Appalachian Power of Bluefield, preferred | 7 | 68 | 68 |
| Cities Service of New York, common | +extra | 211 | 210 |
| Cities Service of New York, preferred | 6 | 74¾ | 74½ |
| Commonwealth Edison of Chicago | 8 | 100 | 100 |
| Comm. Power, Railway & Light of Jackson, common | .. | 19 | 18 |
| Comm. Power, Railway & Light of Jackson, preferred | 6 | 45 | 44 |
| Federal Light & Traction of New York, common | .. | 6 | 6 |
| Federal Light & Traction of New York, preferred | .. | 29½ | 29½ |
| Illinois Northern Utilities of Dixon | 6 | .. | .. |
| Middle West Utilities of Chicago, common | 2+extra | 15 | 15 |
| Middle West Utilities of Chicago, preferred | 6 | .. | .. |
| Northern States Power of Chicago, common | .. | 44 | 44 |
| Northern States Power of Chicago, preferred | ex.div.7 | 84½ | 84 |
| Pacific Gas & Electric of San Francisco, common | .. | 32½ | 33 |
| Pacific Gas & Electric of San Francisco, preferred | 6 | 79½ | 79 |
| Public Service of Northern Illinois, Chicago, common | 7 | 71¾ | 71¾ |
| Public Service of Northern Illinois, Chicago, preferred | 6 | 84 | 84 |
| Republic Railway & Light of Youngstown, common | 4 | 20 | 19 |
| Republic Railway & Light of Youngstown, preferred | 6 | 59 | 59 |
| Standard Gas & Electric of Chicago, common | .. | 4 | 4 |
| Standard Gas & Electric of Chicago, preferred | 6 | 24 | 24 |
| Tennessee Railway, Light & Power of Chattanooga, common | .. | 3 | 3 |
| Tennessee Railway, Light & Power of Chattanooga, preferred | 6 | 13 | 13 |
| United Light & Railways of Grand Rapids, common | 4 | 30 | 29 |
| United Light & Railways of Grand Rapids, preferred | 6 | 64 | 61 |
| Western Power of San Francisco, common | .. | 12 | 12 |
| Western Power of San Francisco, preferred | 6 | 49 | 48 |
| Western Union Telegraph of New York | extra | 91 | 91 |
| Industrials— | | | |
| Electric Storage of Philadelphia, common | 4 | 49 | 50½ |
| General Electric of Schenectady | 8 | 144½ | 143 |
| Westinghouse Electric & Mfg. of Pittsburgh, common | +extra | 42½ | 43 |
| Westinghouse Electric & Mfg. of Pittsburgh, preferred | 7 | 63 | 64 |

*Last sale.